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August 3, 2018

DRAFT

# City of Mayer, Minnesota

## Water Treatment Facility Capital Improvement Plan

**M24.116310**

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# Certification

Water Treatment Facility Capital Improvement Plan

For

City of Mayer, Minnesota

M24.116310

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

By: _____

Ryan P Kotta P.E.
License No. 48754

Date: _____

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# I. INTRODUCTION

The following Capital Improvement Plan (CIP) is intended to assist in determining the long-term financial allocation that will be required to maintain adequate and reliable performance of the Mayer Water Treatment Facility. The plan identifies major capital improvements, their approximate cost, and a recommended implementation schedule. This information is based on the current age of the equipment, the expected design life of each item, visual inspection, and input from the facility's staff. The planning period extends from 2018 to 2040.

This plan includes a review of recent and projected water demands relative to treatment capacity. Capacity limitations and the cost of expansion are summarized.

# II. WATER TREATMENT FACILITY BACKGROUND

The existing facility was evaluated, including a review of the construction record drawings, visual site inspections, and conversations with the treatment facility staff. Construction of the water treatment facility was completed in 2008. Treatment consists of the following basic processes:

- Groundwater is pumped from two wells to an aerator before flowing into a detention tank.
- Chemical injection ports allow for addition of chlorine and potassium permanganate prior to the detention tank, and polymer and potassium permanganate after the detention tank.
- Water leaving the detention tank can enter one of two gravity sand filters or a pre-filtration settling basin. The pre-filtration settling basin is configured such that it can be converted to an additional filter if additional capacity is required at a later date. The filter media is greensand and anthracite. Each filter has an area of 64 square feet and has a design filtration rate of 160-gallons per minute. The filters use a combined air and water backwash.
- Backwash water flows into a reclaim tank, where it can be returned to the detention tank or discharged to a sanitary sewer.
- Treated water enters an 82,000-gallon clearwell. Two high service pumps transport the treated water from the clearwell to the City's water tower.

A process flow diagram is provided as Figure 2.1.

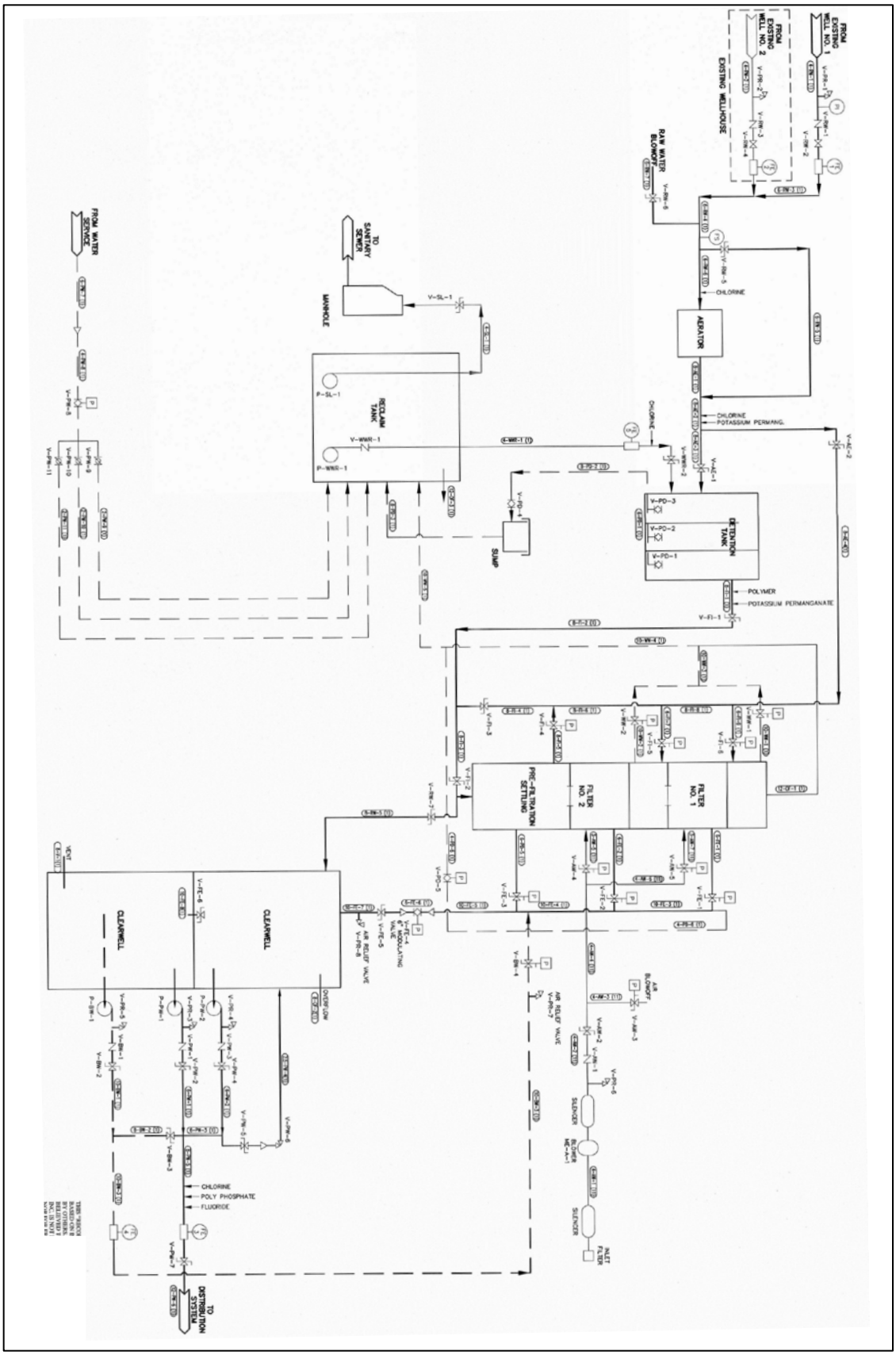


**Figure 2.1 – Process Flow Diagram**

# III. POPULATION AND WATER DEMAND PROJECTIONS

## A. POPULATION

The Mayer Water Treatment Facility currently serves a residential population of approximately 2,000 with no significant industrial users. Metropolitan Council growth projections for the City of Mayer and Carver County are included in Table 3.1 and Figure 3.1. The planning period of this CIP extends to 2040.

There is some indication that Mayer's growth in recent years has exceeded the Metropolitan Council's long-term estimates. This is not reflected in our projections; however, it is recommended that Mayer periodically revisit population, capacity, and water demand.

**Table 3.1 – Historical and Projected Population**

| Year | City of Mayer | Carver County | |
|---|---|---|---|
| | Met Council | Met Council | Minnesota State Demographic Center |
| 1995 | 537 | 59,644 | 59,644 |
| 2000 | 594 | 70,860 | 70,860 |
| 2005 | 1,161 | 83,943 | 83,943 |
| 2010 | 1,749 | 91,042 | 91,341 |
| 2020 | 2,070 | 108,520 | 106,935 |
| 2030 | 2,520 | 135,960 | 116,492 |
| 2040 | 2,950 | 161,240 | 124,672 |

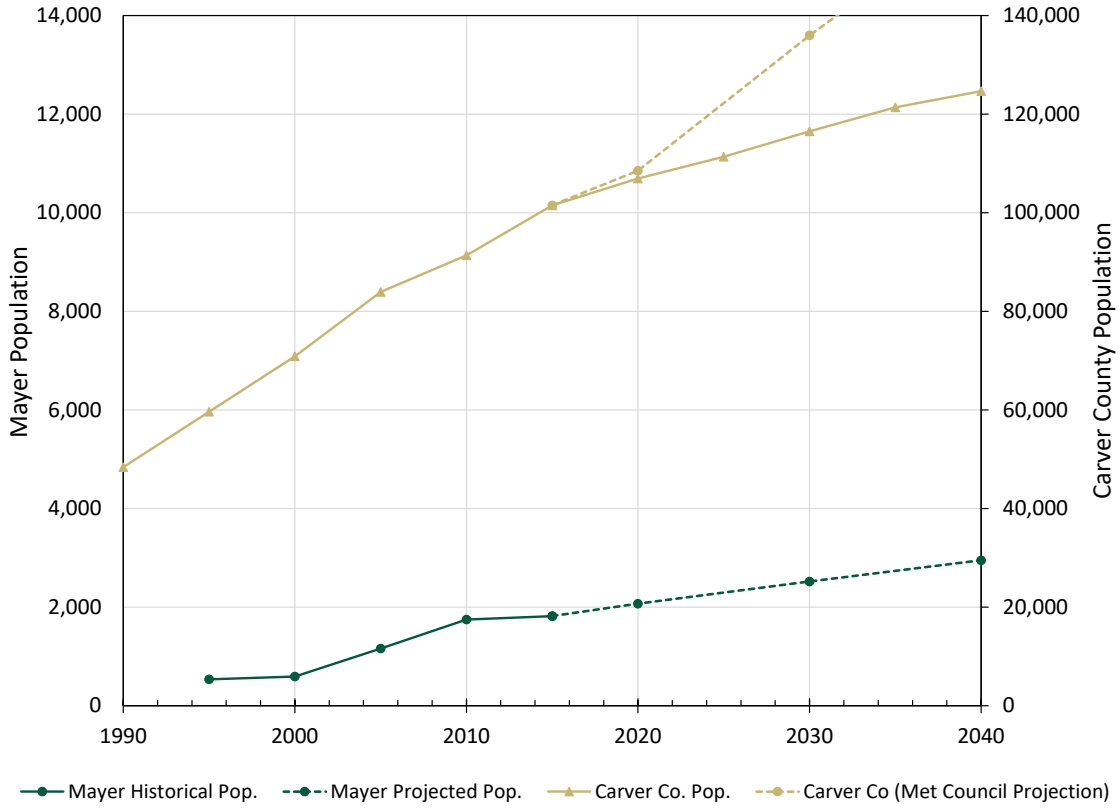


**Figure 3.1 – Historical and Projected Population for the City of Mayer**

## B. EXISTING AND PROJECTED WATER DEMAND

Existing water demand data is provided in Table 3.2. Peaks generally occur in June, July, and August, which is typical of residential systems.

Peak daily demand normalized by the estimated population is provided in Table 3.3. It appears that peak consumption varies between 160 and 220 gallons per person per day. Due to the inherent difficulty of predicting future demands, we have used the peak of this range when extrapolating future water demand. Projected future demand is presented in Table 3.4.

**Table 3.2 – Recorded Water Demand Rates**

| Year | Average-Day Demand (Gallons per Day) | Peak Month Demand (Gallons per Day) | Peak Daily Demand (Gallons per Day) |
|---|---|---|---|
| 2010 | 128,983 | 171,000 | --- |
| 2011 | 132,652 | 199,290 | --- |
| 2012 | 138,825 | 235,710 | --- |
| 2013 | 142,790 | 246,677 | 387,000 |
| 2014 | 139,061 | 222,516 | 295,000 |
| 2015 | 152,140 | 201,258 | 312,000 |
| 2016 | 153,300 | 204,871 | 327,000 |
| 2017 | 189,358 | 271,903 | 435,000 |

**Table 3.3 –Demand Normalized by Population**

| Year | Average-Day Demand | Peak Daily Demand | Estimated Population | Normalized Average-Day Demand | Normalized Peak-Day Demand |
|---|---|---|---|---|---|
| | (Gallons per Day) | | | (Gallons per Day per Person) | |
| 2013 | 142,790 | 387,000 | 1,845 | 77 | 210 |
| 2014 | 139,061 | 295,000 | 1,877 | 74 | 157 |
| 2015 | 152,140 | 312,000 | 1,910 | 80 | 163 |
| 2016 | 153,300 | 327,000 | 1,942 | 79 | 168 |
| 2017 | 189,358 | 435,000 | 1,974 | 96 | 220 |

**Table 3.4 – Project Population and Water Demand**

| Year | Projected Population | Projected Average-Day Demand (Gallons per Day) | Projected Peak Day Demand (Gallons per Day) |
|---|---|---|---|
| 2020 | 2,070 | 167,670 | 455,400 |
| 2025 | 2,295 | 185,895 | 504,900 |
| 2030 | 2,520 | 204,120 | 554,400 |
| 2035 | 2,735 | 221,535 | 601,700 |
| 2040 | 2,950 | 238,950 | 649,000 |

# IV. EVALUATION OF EXISTING FACILITIES

## A. TREATMENT FACILITY EXTERIOR

The treatment facility's exterior (Figure 4.2-left) is clean and free of any major cracks or visible structural deficiencies. The exterior lights have recently been replaced with LEDs. Facility staff stated that the exterior brick had never been sealed, which is recommended every 5-10 years to help preserve the structure and prevent leaks. Rust spots were noted on the exterior handrail (Figure 4.2-right), which would benefit from repainting. Facility staff noted that the roof had experienced minor leaks, and that replacement may eventually be required.

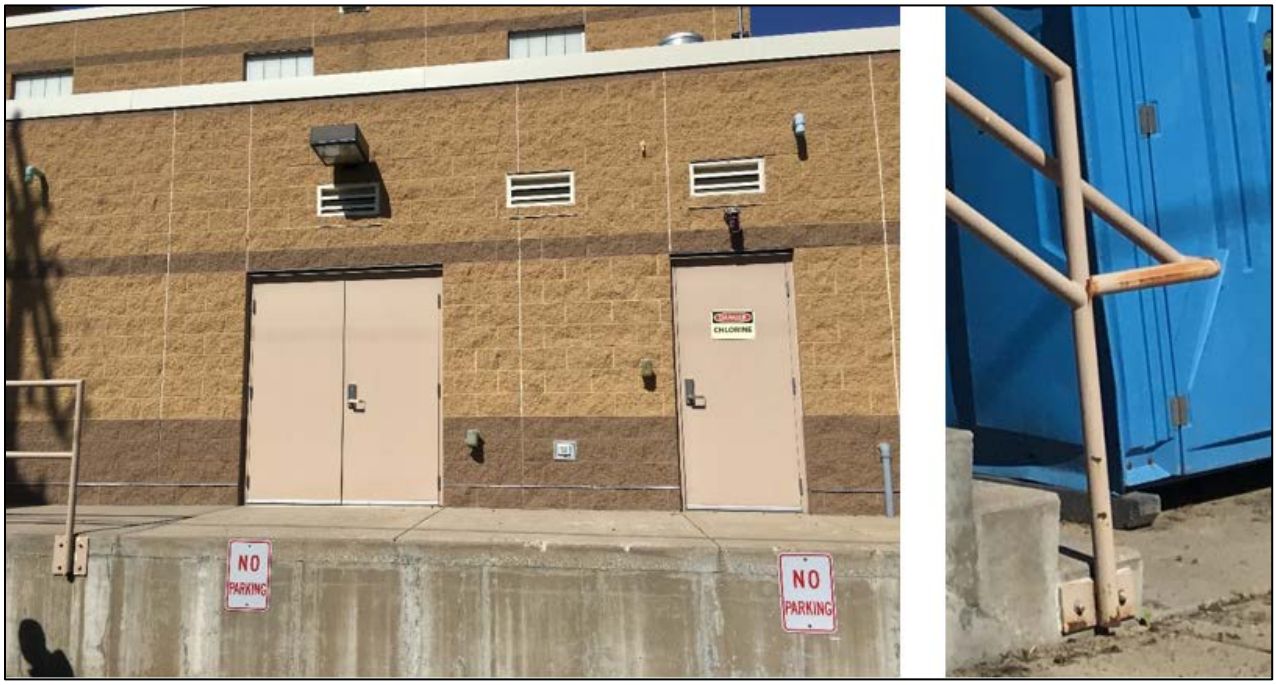


**Figure 4.1 – Building East Exterior (left) and Handrail (right)**

## B. WELLS

The City has two wells, designated Well 1 and Well 2.

Well 1 is a pitless unit with a capacity of approximately 190 gpm. City staff report that televising of the well indicated an obstruction approximately 200-feet below grade which is inhibiting flow.

Well 2 is a 380 gpm submersible unit located in a well house. It is supported by a backup generator. The pump motor was recently replaced and the well televised. The well and casing were reported to be in good condition.

The well house was constructed in 2001. Its roof was replaced in 2017. The well house structure appears to be free of major structural deficiencies; however, a moderate amount of rust was visible on the exposed piping. Plant staff stated that they suspect inconsistencies with the Well 2 flow meter. It is recommended that the Well 2 piping, valves, and flow meter be considered for replacement. It is also recommended that the well house be provided with a higher capacity dehumidifier in order to extend the life of the equipment present.

The generator was installed in 2001. It is exercised regularly, and appears to be in good condition.

**Figure 4.2 – Well 2 Exterior**

**Figure 4.3 – Well 2 Interior**

## C. AERATOR AND DETENTION TANK

Facility staff indicated that the aerator was cleaned in 2017. The aerator media consists of PVC pipes, which facility staff stated were found to have minimal degradation when cleaned.

## D. FILTERS

The facility has two concrete gravity sand filters with greensand and anthracite media. Each filter has a surface area of 64 square feet, providing a total of 360 gpm filtration capacity. The filters use a combined air and water backwash.

It is estimated that the peak-day water demand will exceed the current filtration capacity by 2020. The facility includes a pre-filtration settling basin which can be converted to an additional sand filter with minimal modification. Doing so would increase filtration capacity to 480 gpm, which is projected to be sufficient until at least 2040.

No major structural deficiencies were apparent in the filter area; however, several areas of peeling paint were visible. It is recommended that the areas of deficient paint be sandblasted and recoated. The filter level transducers were replaced in 2013.

No deficiencies were detected with the following items; however, it is expected that they will require replacement or refurbishment sometime within the next 20 years.

- Filter media should be sent for testing approximately every 10 years. Acid washing or replacement may be required if the tests indicate excessive chemical deposits or abrasion.
- Coatings typically last 10 years before a major touchup effort is required.

**Figure 4.4 - Filter Area Paint Deterioration**

**Figure 4.5 – Filters and Level Transducers**

## E. CLEARWELL

The clearwell has 82,502 gallons of storage capacity with a dividing wall to allow service to be performed. Facility staff report that the clearwell transducers were replaced in 2017. No deficiencies were noted in this area.

## F. HIGH SERVICE PUMPS

The high service pumps are original to the 2008 construction. They have been inspected in place by Thein Well. The variable frequency drive of Pump 1 was replaced in 2017. Facility staff noted a concern that the bearings of Pump 1 were in poor condition. Both pumps may require eventual replacement or refurbishment. Additionally, the pumps have less firm capacity than the facility's current peak-day demand. It is recommended that higher capacity pumps be considered.

**Figure 4.6 – High Service Pumps**

## G. BACKWASH RECLAIM TANK

The backwash reclaim tank is a 45,000 gallon prefabricated concrete basin. It is equipped with a spray wash nozzle and sludge disposal pump to be able to discharge solids to the municipal sewer. City staff stated that the spray wash system on the tank is not metered. Installation of such a meter is recommended. The tank is also equipped with a 3-horsepower water return pump.

The reclaim tank pumps and nozzles are currently functional; however, it is anticipated that they will require replacement within the 20-year capital improvement planning period.

**Figure 4.7 – Reclaim Tank**

## H. CHEMICAL STORAGE AND PUMPING

The treatment facility stores fluoride, orthophosphate, potassium permanganate, polymer, and chlorine gas. A combination of peristaltic metering pumps and diaphragm metering pumps are used to dose the fluoride, orthophosphate, and potassium permanganate. A chlorine feed system with booster pump is used to dose the chlorine gas. The facility has the capacity to apply polymer; however, facility staff report that they do not typically do so.

It is recommended that the facility consider replacement of the chlorine rotameter, booster pump, and vacuum switches. It may be economical to undertake a complete replacement of the chlorine dosing system at that time.

No major deficiencies were noted with regards to the storage tanks, tank scales, metering pumps, piping, eyewash and drench shower. The peristaltic pumps were replaced in 2015 and the fluoride diaphragm pump was replaced in 2016. Facility staff stated that the chlorine tank regulators were rebuilt in 2017.

Facility staff noted that the chlorine analyzer was not functional, but that purchase of a new one was budgeted. Rust was noted on the heating, ventilation, and some door hardware in the chemical storage area.

**Figure 4.8 – Potassium Permanganate Storage and Pumping**

**Figure 4.9 – Chlorine Gas Metering and Distribution**

## I. BLOWER AND AIR COMPRESSOR

The facility's blower and air compressor are original to the 2008 construction. They are functioning and appear to be in good condition.

**Figure 4.10 – Blower**

**Figure 4.11 – Air Compressor**

## J. MECHANICAL EQUIPMENT

With the exception of one ceiling fan, the facility's unit heaters and ceiling fans are generally functional. The units are generally more susceptible to moisture and heat than other equipment. Replacement will likely be required within the 20-year planning period. Additionally, facility staff noted that the hot water heater was in need of replacement.

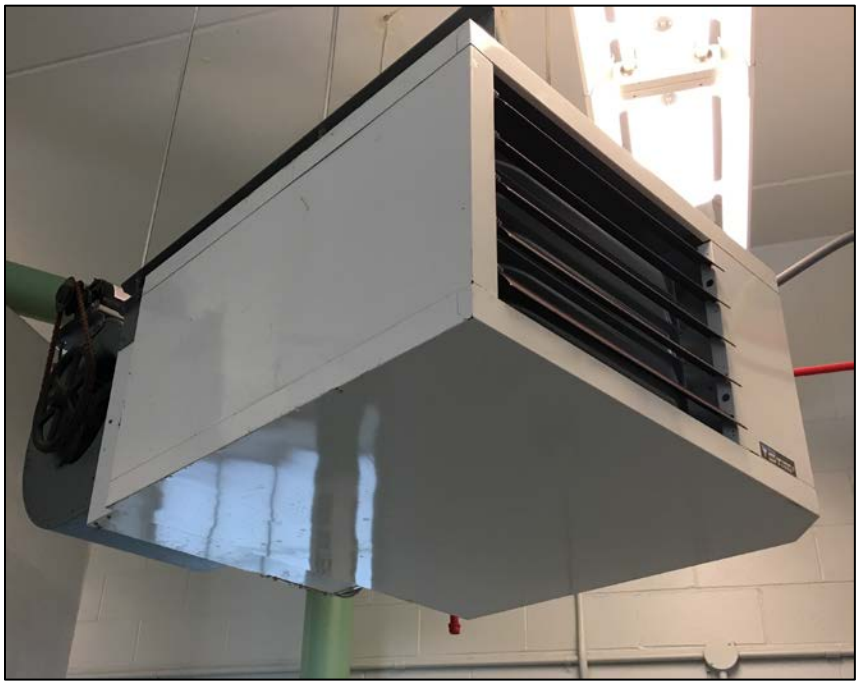

**Figure 4.12 – Unit Heater**

## K. DEHUMIDIFIERS

The facility currently uses two Hi-E Dry 195 model dehumidifiers and one smaller model. It is recommended that the purchase of additional high capacity dehumidifiers be considered in order to extend the life of all equipment and the facility structure.

## L. OFFICE AND LABORATORY AREA

The laboratory was found to have adequate supplies and equipment. No major capital improvements are recommended in the area; however, it is anticipated that basic laboratory equipment and supplies will require replacement over the next 20 years.

The office area would benefit from installation of a new air conditioner and replacement of some ceiling tiles.

**Figure 4.13 – Laboratory**

## M. PIPES AND VALVES

The exposed piping was generally found to be in good condition with minimal paint deterioration or rust. Some valves, such as those in the backwash spray wash system, were identified as unreliable and should be considered for replacement. The reduced pressure zone device was identified as requiring maintenance.

The facility has approximately 40 valves larger than 4-inches. Relatively few issues were reported with these valves; however, it is anticipated that regular replacements will be increasingly required as they approach 40 years of service. Valve actuators typically have a design life of 20 years.

**Figure 4.14 – Process Piping**

**Figure 4.15 – Backwash Spray Piping**

## N. MOTOR CONTROL CENTER AND SCADA

The facility's SCADA system was replaced and upgraded in 2015. There does not appear to be any immediate SCADA needs; however, another major upgrade will likely be required within the next 10 years due to the tendency of manufacturers to stop supporting older hardware.

The motor control center is original to the 2008 construction. One drive has been replaced recently. Facility staff expressed concern regarding the longevity of the motor control center. It is recommended that it be considered for eventual replacement or refurbishment during this planning period.

**Figure 4.16 – Motor Control Center**

## O. GENERATOR

The facility's backup generator receives an annual inspection and maintenance. No issues were reported; however, it is expected to require replacement or major refurbishment in approximately 10 years.

**Figure 4.17 – Backup Generator**

## P. WATER TOWER

The interior of Mayer's water tower was rehabilitated and a mixer was added in 2015. The exterior paint is visibly worn and stained. Repainting the exterior structure would improve its appearance and extend its useful life.

**Figure 4.18 – Water Tower**

## Q. TREATMENT CAPACITY

The Mayer Water Treatment Facility's production is limited by a few process components, summarized in Table 4.1.

Firm capacity is typically used in evaluating the need for expansion, that is, the capacity of each process when its largest piece of equipment is out of service. Strictly applying such a standard would present a distorted view of Mayer's capacity. For example, the facility's filters have a firm capacity of 160 gpm, however, the nature of the filters makes it unlikely that a filter would be unexpectedly and involuntarily taken out of service. It is therefore reasonable to include the total filter area when evaluating capacity. Conversely, an argument could be made that the facility lacks any reliable well pumping capacity. Well 1 is unreliable due to an obstruction. Well 2 was recently inspected and found to be in good condition, however, it presents a single point of vulnerability which could disable treatment in the event of a mechanical failure. It is recommended that Mayer prioritize the development of new wells to eliminate this vulnerability. Additionally, it is typical for water treatment capacities to be evaluated on the basis of 18 hours per day of operation to account for normal process downtime. Table 4.1 presents the firm capacity limitations of the system.

**Table 4.1 – Firm Treatment Capacity Summary**

| Equipment | Equipment Capacity | Firm Capacity |
|---|---|---|
| Well Pumps | Well 1 – 190 gpm (semi-functional)<br>Well 2 – 380 gpm | >142 gpm<br>204,480 gpd |
| Filters | Filter 1 – 160 gpm<br>Filter 2 – 160 gpm | 320 gpm<br>346,000 gpd |
| High Service Pumps | High service pump 1 – 250 gpm<br>High service Pump 2 – 250 gpm` | 250 gpm<br>270,000 gpd |

It should also be noted that record drawings list the aerator as having a 250 gpm capacity, however, it has been our experience that such equipment will be capable of handling additional flow without significantly diminishing treatment quality. The aerator is therefore not included on the list of capacity limitations.

Table 4.2 summarizes the existing source water and treatment capacities along with existing and projected water demands. The most concerning capacity limitation is the firm well capacity. Thein Well was consulted on rehabilitation options for Well 1 but options are limited. Thein indicated the well is open hole and is collapsed just below the casing at approximately 200 feet below grade. The collapsed material can be drilled out but there is no guarantee the hole would not collapse again in the future. Relining and extending the casing deeper will reduce the available capacity since the new casing diameter will be less than the existing. It is recommended that a new well is drilled with an approximate capacity of 500 to 600 gpm. Considering the status of Well 1, it is possible to use the well as is in conjunction with Well 2 to meet current and near term projected demands on with regard to firm capacity however, to meet the long term project demand a second new well will need to be added and Well 1 could then be retired.

The existing treatment firm capacity, which is limited by the high service pumps, is less than the peak-day demand for recent years. It is recommended that Mayer consider replacement to larger high service pumps to correct this limitation. In addition, peak-day demand is projected to exceed filter capacity shortly after 2020. It is recommended that Mayer consider conversion of the pre-settling basin to an additional filter to within the next several years to meet this future need.

| Table 4.2 – Capacity and Demand Summary | |
|---|---|
| Existing Total Well Capacity | 750,000 gpd |
| Existing Firm Well Capacity | 153,000 gpd |
| Existing Total Treatment Capacity | 461,000 gpd |
| Existing Firm Treatment Capacity | 270,000 gpd |
| 2017 Average Demand | 190,000 gpd |
| 2017 Peak Demand | 435,000 gpd |
| Projected 2040 Average Demand | 240,000 gpd |
| Projected 2040 Peak Demand | 649,000 gpd |

## V. CAPITAL IMPROVEMENT PLAN (CIP)

A list of current and projected expenditures necessary to maintain the existing infrastructure of the Mayer Water Treatment Facility has been developed. The cost opinions generated are based on recent projects with similar scopes, input from suppliers, and engineering experience. All prices are in 2018 dollars.

It is estimated that the Mayer Water Treatment Facility will require approximately $400,000 - $650,000 of capital investment in the next few years in order to provide adequate firm capacity for the current peak demands. The range in cost is dependent on if one or two new wells are constructed. Excluding capacity expansion, the average annual cost of equipment maintenance and replacement through 2038 is estimated to be approximately $130,000.

Costs for expansion and equipment maintenance are presented in Tables 5.1 and 5.2. An approximate schedule of future capital improvements is presented in Table 5.3.

| Table 5.1 - Summary of Capacity Expansion Investments | |
|---|---|
| Develop two new wells | $500,000 |
| Convert pre-settling basin to a new filter | $70,000 |
| Install two new replacement high service pumps | $80,000 |

| Table 5.2 - Summary of Capital Improvements | | | |
|---|---|---|---|
| **Description** | **Cost (2018 dollars)** | **Year Planned Replacement** | **Frequency (years)** |
| **Exterior** | | | |
| Exterior lights | $10,000 | 2033 | 15 |
| Seal exterior bricks | $10,000 | 2020 | 10 |
| Treatment facility roof | $30,000 | 2020 | 20 |
| Exterior doors, railings, and hardware | $5,000 | 2020 | 20 |
| **Reclaim Tank** | | | |
| Reclaim tank structure | - | - | - |
| Reclaim tank piping and valves | $50,000 | 2048 | 40 |
| Reclaim return pump | $5,000 | 2028 | 20 |
| Reclaim discharge pump | $5,000 | 2028 | 20 |
| **Well 1** | | | |
| Well 1 casing | $50,000 | 2058 | 50 |
| Well 1 pump | $20,000 | 2028 | 20 |
| Well 1 valves and flow meter | $20,000 | 2038 | 30 |
| **Well 2** | | | |
| Well 2 casing | $50,000 | 2058 | 50 |
| Well 2 pump | $20,000 | 2028 | 20 |
| Well 2 valves and flow meter | $20,000 | 2038 | 30 |
| Well House Roof | $6,000 | 2037 | 20 |
| Well 2 backup generator and transformer | $50,000 | 2030 | 30 |
| **Filter Room** | | | |
| Blow-off valve | $5,000 | 2048 | 40 |
| Aerator | $55,000 | 2038 | 30 |
| Aerator media | $2,000 | 2023 | 15 |
| Aerator bypass valve | $5,000 | 2048 | 40 |
| Detention tank paint | $4,000 | 2028 | 20 |
| Filter structure | -- | -- | -- |

| Table 5.2 - Summary of Capital Improvements | | | |
|---|---|---|---|
| **Description** | **Cost (2018 dollars)** | **Year Planned Replacement** | **Frequency (years)** |
| Filter media | $20,000 | 2020 | 12 |
| Filter paint | $10,000 | 2020 | 10 |
| Filter level transducers | $10,000 | 2028 | 20 |
| Filter piping and valves | $125,000 | 2048 | 40 |
| Filter valve actuators | $40,000 | 2038 | 30 |
| Blower control valves | $10,000 | 2028 | 20 |
| Dehumidifiers | $6,000 | 2023 | 15 |
| Sump pumps | $2,000 | 2028 | 20 |
| Air compressor | $25,000 | 2038 | 30 |
| Piping | $100,000 | 2048 | 40 |
| Filter room paint | $10,000 | 2023 | 15 |
| Filter room unit heaters | $8,000 | 2020 | 10 |
| Filter room lighting | $5,000 | 2023 | 15 |
| **Pump Room** | | | |
| High service pump 1 | $60,000 | 2028 | 20 |
| High service pump 2 | $60,000 | 2028 | 20 |
| High service pump piping and valves | $50,000 | 2048 | 40 |
| Backwash pump | $50,000 | 2028 | 20 |
| Backwash pump piping and valves | $25,000 | 2048 | 40 |
| Flow meters | $15,000 | 2028 | 20 |
| Blower | $30,000 | 2028 | 20 |
| Clearwell structure | -- | - | - |
| Clearwell piping and valves | $30,000 | 2048 | 40 |
| Clearwell level transducer | $10,000 | 2023 | 15 |
| Pump room dehumidifier | $3,000 | 2023 | 15 |
| Pump room unit heaters | $8,000 | 2023 | 15 |
| Pump room lighting | $5,000 | 2023 | 15 |
| **Electrical and Generator Rooms** | | | |
| Motor control center and breakers | $150,000 | 2023 | 15 |
| Instrumentation/Control Updates | $20,000 | 2022 | 6 |
| Electrical room unit heater | $1,000 | 2023 | 15 |
| Electrical room lights | $5,000 | 2023 | 15 |
| Backup generator major overhaul | $30,000 | 2038 | 20 |
| **Chemical Rooms** | | | |
| Fluoride storage tank | $8,000 | 2023 | 15 |
| Fluoride tank scale | $3,000 | 2023 | 15 |
| Fluoride metering pumps and accessories | $5,000 | 2023 | 5 |
| Orthophosphate storage tank | $8,000 | 2023 | 15 |
| Orthophosphate tank scale | $3,000 | 2023 | 15 |
| Orthophosphate metering pump and accessories | $5,000 | 2023 | 5 |
| Permanganate storage tank | $8,000 | 2023 | 15 |
| Permanganate tank scale | $3,000 | 2023 | 15 |
| Permanganate metering pump and accessories | $5,000 | 2023 | 5 |
| Drench shower and eyewash | $3,000 | 2028 | 20 |
| Chlorine tank scales | $5,000 | 2023 | 15 |
| Chlorine rotameter, piping, and valves | $10,000 | 2020 | 12 |
| Chlorine booster pump | $8,000 | 2020 | 12 |
| Dehumidifier | $3,000 | 2023 | 15 |
| Chemical room unit heater | $8,000 | 2028 | 10 |
| Chemical room lighting | $5,000 | 2023 | 15 |

| Table 5.2 - Summary of Capital Improvements | | | |
|---|---|---|---|
| **Description** | **Cost (2018 dollars)** | **Year Planned Replacement** | **Frequency (years)** |
| **Mechanical Room** | | | |
| Water heater | $5,000 | 2023 | 15 |
| RPZ and other valves | $10,000 | 2028 | 20 |
| Mechanical room unit heater | $1,000 | 2020 | 12 |
| **Office and Laboratory** | | | |
| Office SCADA computer | $3,000 | 2023 | 5 |
| Laboratory equipment | $5,000 | 2023 | 5 |
| **Water Tower** | | | |
| Tower Painting Rehabilitation | $200,000 | 2020 | 15 |

| Table 5.3 Capital Investment Implementation Schedule | | | | | |
|---|---|---|---|---|---|
| **2020** | **2021** | **2022** | **2023** | **2024** | **2025** |
| **Exterior** | | | | | |
| Seal exterior bricks, treatment facility roof, exterior doors, railings, and hardware | | | | | |
| **Reclaim Tank** | | | | | |
| | | | | | |
| **Well 1** | | | | | |
| | | | | | |
| **Well 2** | | | | | |
| | | | | | |
| **Filter Room** | | | | | |
| Filter media, filter paint, | | | Aerator media, dehumidifiers, filter room paint, filter room lighting, filter room unit heaters | | |
| **Pump Room** | | | | | |
| | | | Clearwell level transducer, pump room dehumidifier, pump room unit heaters, pump room lighting | | |
| **Electrical and Generator Rooms** | | | | | |
| | | | Motor control center and breakers, instrumentation/control Updates electrical room unit heater, electrical room lights | | |
| **Chemical Rooms** | | | | | |
| Chlorine rotameter, piping, and valves, chlorine booster pump | | | Chemical storage tanks, tanks scales, metering, and accessories, dehumidifier, chemical room lighting | | |
| **Mechanical Room** | | | | | |
| Unit heater | | | Water heater | | |
| **Office and Laboratory** | | | | | |
| | | | Office SCADA computer, laboratory equipment | | |
| **Water Tower** | | | | | |
| Tower Painting Rehabilitation | | | | | |

| Table 5.3 Capital Investment Implementation Schedule | | | | | | |
|---|---|---|---|---|---|---|
| **2026** | **2027** | **2028** | **2029** | **2030** | **2031** | **2032** |
| **Exterior** | | | | | | |
| | | | | Seal exterior bricks | | |
| **Reclaim Tank** | | | | | | |
| | | Reclaim return pump, reclaim discharge pump | | | | |
| **Well 1** | | | | | | |
| | | Well 1 pump | | | | |
| **Well 2** | | | | | | |
| | | Well 2 pump | | Backup generator and transfer switch | | |
| **Filter Room** | | | | | | |
| | | Detention tank paint, Filter level transducers, Sump pumps, Blower control valves | | Filter paint | | Filter media |
| **Pump Room** | | | | | | |
| | | High-service pump 1, high-service pump 2, backwash pump, flow meters, blower | | | | |
| **Electrical and Generator Rooms** | | | | | | |
| | | | Instrumentation and controls update | | | |
| **Chemical Rooms** | | | | | | |
| | | Metering pumps, unit heaters, eyewash | | | | Chlorine rotameter, piping, and valves, chlorine booster pump |
| **Mechanical Room** | | | | | | |
| | | RPZ and other valves | | | | Mechanical room unit heater |
| **Office and Laboratory** | | | | | | |
| | | Office SCADA computer, laboratory equipment | | | | |
| **Water Tower** | | | | | | |
| | | | | | | |

| Table 5.3 Capital Investment Implementation Schedule | | | | | |
|---|---|---|---|---|---|
| **2033** | **2034** | **2035** | **2036** | **2037** | **2038** |
| **Exterior** | | | | | |
| Exterior lights | | | | | |
| **Reclaim Tank** | | | | | |
| | | | | | |
| **Well 1** | | | | | |
| | | | | | Valves and flow meter |
| **Well 2** | | | | | |
| | | | | | Valves and flow meter |
| **Filter Room** | | | | | |
| Unit heaters | | | | | Aerator, aerator media, dehumidifiers, air compressor, filter room paint, filter room lighting |
| **Pump Room** | | | | | |
| | | | | | Clearwell level transducer, dehumidifier, unit heaters, lighting |
| **Electrical and Generator Rooms** | | | | | |
| | | Instrumentation and controls update | | | Motor control center and breakers, unit heats, lights, backup generator overhaul |
| **Chemical Rooms** | | | | | |
| Chemical metering pumps and accessories | | | | | Metering pumps, tanks, tank scales, and accessories, Chlorine tank scale, dehumidifier, unit heaters, lighting |
| **Mechanical Room** | | | | | |
| | | | | | Mechanical room unit heater, water heater |
| **Office and Laboratory** | | | | | |
| Office SCADA computer Laboratory equipment | | | | | Office SCADA computer, laboratory equipment |
| **Water Tower** | | | | | |
| | | | | | |

# Appendix A:  EPA Water Quality Standards

# National Primary Drinking Water Regulations

| Contaminant | | MCL or TT[1] (mg/L)[2] | Potential health effects from long-term[3] exposure above the MCL | Common sources of contaminant in drinking water | Public Health Goal (mg/L)[2] |
|---|---|---|---|---|---|
| OC | Acrylamide | TT[4] | Nervous system or blood problems; increased risk of cancer | Added to water during sewage/ wastewater treatment | zero |
| OC | Alachlor | 0.002 | Eye, liver, kidney or spleen problems; anemia; increased risk of cancer | Runoff from herbicide used on row crops | zero |
| R | Alpha/photon emitters | 15 picocuries per Liter (pCi/L) | Increased risk of cancer | Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation | zero |
| IOC | Antimony | 0.006 | Increase in blood cholesterol; decrease in blood sugar | Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder | 0.006 |
| IOC | Arsenic | 0.010 | Skin damage or problems with circulatory systems, and may have increased risk of getting cancer | Erosion of natural deposits; runoff from orchards; runoff from glass & electronics production wastes | 0 |
| IOC | Asbestos (fibers >10 micrometers) | 7 million fibers per Liter (MFL) | Increased risk of developing benign intestinal polyps | Decay of asbestos cement in water mains; erosion of natural deposits | 7 MFL |
| OC | Atrazine | 0.003 | Cardiovascular system or reproductive problems | Runoff from herbicide used on row crops | 0.003 |
| IOC | Barium | 2 | Increase in blood pressure | Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits | 2 |
| OC | Benzene | 0.005 | Anemia; decrease in blood platelets; increased risk of cancer | Discharge from factories; leaching from gas storage tanks and landfills | zero |
| OC | Benzo(a)pyrene (PAHs) | 0.0002 | Reproductive difficulties; increased risk of cancer | Leaching from linings of water storage tanks and distribution lines | zero |
| IOC | Beryllium | 0.004 | Intestinal lesions | Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries | 0.004 |
| R | Beta photon emitters | 4 millirems per year | Increased risk of cancer | Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation | zero |
| DBP | Bromate | 0.010 | Increased risk of cancer | Byproduct of drinking water disinfection | zero |
| IOC | Cadmium | 0.005 | Kidney damage | Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints | 0.005 |
| OC | Carbofuran | 0.04 | Problems with blood, nervous system, or reproductive system | Leaching of soil fumigant used on rice and alfalfa | 0.04 |
| OC | Carbon tetrachloride | 0.005 | Liver problems; increased risk of cancer | Discharge from chemical plants and other industrial activities | zero |
| D | Chloramines (as $Cl_2$) | MRDL=4.0[1] | Eye/nose irritation; stomach discomfort; anemia | Water additive used to control microbes | MRDLG=4[1] |
| OC | Chlordane | 0.002 | Liver or nervous system problems; increased risk of cancer | Residue of banned termiticide | zero |
| D | Chlorine (as $Cl_2$) | MRDL=4.0[1] | Eye/nose irritation; stomach discomfort | Water additive used to control microbes | MRDLG=4[1] |
| D | Chlorine dioxide (as $ClO_2$) | MRDL=0.8[1] | Anemia; infants, young children, and fetuses of pregnant women: nervous system effects | Water additive used to control microbes | MRDLG=0.8[1] |
| DBP | Chlorite | 1.0 | Anemia; infants, young children, and fetuses of pregnant women: nervous system effects | Byproduct of drinking water disinfection | 0.8 |
| OC | Chlorobenzene | 0.1 | Liver or kidney problems | Discharge from chemical and agricultural chemical factories | 0.1 |
| IOC | Chromium (total) | 0.1 | Allergic dermatitis | Discharge from steel and pulp mills; erosion of natural deposits | 0.1 |
| IOC | Copper | TT[5]; Action Level = 1.3 | Short-term exposure: Gastrointestinal distress. Long-term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level | Corrosion of household plumbing systems; erosion of natural deposits | 1.3 |
| M | *Cryptosporidium* | TT[7] | Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps) | Human and animal fecal waste | zero |

**LEGEND**

- D — Disinfectant
- DBP — Disinfection Byproduct
- IOC — Inorganic Chemical
- M — Microorganism
- OC — Organic Chemical
- R — Radionuclides

| Contaminant | MCL or TT[1] (mg/L)[2] | Potential health effects from long-term[3] exposure above the MCL | Common sources of contaminant in drinking water | Public Health Goal (mg/L)[2] |
|---|---|---|---|---|
| IOC Cyanide (as free cyanide) | 0.2 | Nerve damage or thyroid problems | Discharge from steel/metal factories; discharge from plastic and fertilizer factories | 0.2 |
| OC 2,4-D | 0.07 | Kidney, liver, or adrenal gland problems | Runoff from herbicide used on row crops | 0.07 |
| OC Dalapon | 0.2 | Minor kidney changes | Runoff from herbicide used on rights of way | 0.2 |
| OC 1,2-Dibromo-3-chloropropane (DBCP) | 0.0002 | Reproductive difficulties; increased risk of cancer | Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards | zero |
| OC o-Dichlorobenzene | 0.6 | Liver, kidney, or circulatory system problems | Discharge from industrial chemical factories | 0.6 |
| OC p-Dichlorobenzene | 0.075 | Anemia; liver, kidney or spleen damage; changes in blood | Discharge from industrial chemical factories | 0.075 |
| OC 1,2-Dichloroethane | 0.005 | Increased risk of cancer | Discharge from industrial chemical factories | zero |
| OC 1,1-Dichloroethylene | 0.007 | Liver problems | Discharge from industrial chemical factories | 0.007 |
| OC cis-1,2-Dichloroethylene | 0.07 | Liver problems | Discharge from industrial chemical factories | 0.07 |
| OC trans-1,2-Dichloroethylene | 0.1 | Liver problems | Discharge from industrial chemical factories | 0.1 |
| OC Dichloromethane | 0.005 | Liver problems; increased risk of cancer | Discharge from drug and chemical factories | zero |
| OC 1,2-Dichloropropane | 0.005 | Increased risk of cancer | Discharge from industrial chemical factories | zero |
| OC Di(2-ethylhexyl) adipate | 0.4 | Weight loss, liver problems, or possible reproductive difficulties | Discharge from chemical factories | 0.4 |
| OC Di(2-ethylhexyl) phthalate | 0.006 | Reproductive difficulties; liver problems; increased risk of cancer | Discharge from rubber and chemical factories | zero |
| OC Dinoseb | 0.007 | Reproductive difficulties | Runoff from herbicide used on soybeans and vegetables | 0.007 |
| OC Dioxin (2,3,7,8-TCDD) | 0.00000003 | Reproductive difficulties; increased risk of cancer | Emissions from waste incineration and other combustion; discharge from chemical factories | zero |
| OC Diquat | 0.02 | Cataracts | Runoff from herbicide use | 0.02 |
| OC Endothall | 0.1 | Stomach and intestinal problems | Runoff from herbicide use | 0.1 |
| OC Endrin | 0.002 | Liver problems | Residue of banned insecticide | 0.002 |
| OC Epichlorohydrin | TT[4] | Increased cancer risk; stomach problems | Discharge from industrial chemical factories; an impurity of some water treatment chemicals | zero |
| OC Ethylbenzene | 0.7 | Liver or kidney problems | Discharge from petroleum refineries | 0.7 |
| OC Ethylene dibromide | 0.00005 | Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer | Discharge from petroleum refineries | zero |
| M Fecal coliform and *E. coli* | MCL[6] | Fecal coliforms and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes may cause short term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, and people with severely compromised immune systems. | Human and animal fecal waste | zero[6] |
| IOC Fluoride | 4.0 | Bone disease (pain and tenderness of the bones); children may get mottled teeth | Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories | 4.0 |
| M *Giardia lamblia* | TT[7] | Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps) | Human and animal fecal waste | zero |
| OC Glyphosate | 0.7 | Kidney problems; reproductive difficulties | Runoff from herbicide use | 0.7 |
| DBP Haloacetic acids (HAA5) | 0.060 | Increased risk of cancer | Byproduct of drinking water disinfection | n/a[9] |
| OC Heptachlor | 0.0004 | Liver damage; increased risk of cancer | Residue of banned termiticide | zero |
| OC Heptachlor epoxide | 0.0002 | Liver damage; increased risk of cancer | Breakdown of heptachlor | zero |
| M Heterotrophic plate count (HPC) | TT[7] | HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is. | HPC measures a range of bacteria that are naturally present in the environment | n/a |

**LEGEND**

- D Disinfectant
- DBP Disinfection Byproduct
- IOC Inorganic Chemical
- M Microorganism
- OC Organic Chemical
- R Radionuclides

| | Contaminant | MCL or TT[1] (mg/L)[2] | Potential health effects from long-term[3] exposure above the MCL | Common sources of contaminant in drinking water | Public Health Goal (mg/L)[2] |
|---|---|---|---|---|---|
| OC | Hexachlorobenzene | 0.001 | Liver or kidney problems; reproductive difficulties; increased risk of cancer | Discharge from metal refineries and agricultural chemical factories | zero |
| OC | Hexachlorocyclopentadiene | 0.05 | Kidney or stomach problems | Discharge from chemical factories | 0.05 |
| IOC | Lead | TT5; Action Level=0.015 | Infants and children: Delays in physical or or mental development; children could show slight deficits in attention span and learning abilities; Adults: Kidney problems; high blood pressure | Corrosion of household plumbing systems; erosion of natural deposits | zero |
| M | *Legionella* | TT7 | Legionnaire's Disease, a type of pneumonia | Found naturally in water; multiplies in heating systems | zero |
| OC | Lindane | 0.0002 | Liver or kidney problems | Runoff/leaching from insecticide used on cattle, lumber, gardens | 0.0002 |
| IOC | Mercury (inorganic) | 0.002 | Kidney damage | Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands | 0.002 |
| OC | Methoxychlor | 0.04 | Reproductive difficulties | Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock | 0.04 |
| IOC | Nitrate (measured as Nitrogen) | 10 | Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome. | Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits | 10 |
| IOC | Nitrite (measured as Nitrogen) | 1 | Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome. | Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits | 1 |
| OC | Oxamyl (Vydate) | 0.2 | Slight nervous system effects | Runoff/leaching from insecticide used on apples, potatoes, and tomatoes | 0.2 |
| OC | Pentachlorophenol | 0.001 | Liver or kidney problems; increased cancer risk | Discharge from wood-preserving factories | zero |
| OC | Picloram | 0.5 | Liver problems | Herbicide runoff | 0.5 |
| OC | Polychlorinated biphenyls (PCBs) | 0.0005 | Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer | Runoff from landfills; discharge of waste chemicals | zero |
| R | Radium 226 and Radium 228 (combined) | 5 pCi/L | Increased risk of cancer | Erosion of natural deposits | zero |
| IOC | Selenium | 0.05 | Hair or fingernail loss; numbness in fingers or toes; circulatory problems | Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines | 0.05 |
| OC | Simazine | 0.004 | Problems with blood | Herbicide runoff | 0.004 |
| OC | Styrene | 0.1 | Liver, kidney, or circulatory system problems | Discharge from rubber and plastic factories; leaching from landfills | 0.1 |
| OC | Tetrachloroethylene | 0.005 | Liver problems; increased risk of cancer | Discharge from factories and dry cleaners | zero |
| IOC | Thallium | 0.002 | Hair loss; changes in blood; kidney, intestine, or liver problems | Leaching from ore-processing sites; discharge from electronics, glass, and drug factories | 0.0005 |
| OC | Toluene | 1 | Nervous system, kidney, or liver problems | Discharge from petroleum factories | 1 |
| M | Total Coliforms | 5.0 percent[8] | Coliforms are bacteria that indicate that other, potentially harmful bacteria may be present. See fecal coliforms and *E. coli* | Naturally present in the environment | zero |
| DBP | Total Trihalomethanes (TTHMs) | 0.080 | Liver, kidney or central nervous system problems; increased risk of cancer | Byproduct of drinking water disinfection | n/a[9] |
| OC | Toxaphene | 0.003 | Kidney, liver, or thyroid problems; increased risk of cancer | Runoff/leaching from insecticide used on cotton and cattle | zero |
| OC | 2,4,5-TP (Silvex) | 0.05 | Liver problems | Residue of banned herbicide | 0.05 |
| OC | 1,2,4-Trichlorobenzene | 0.07 | Changes in adrenal glands | Discharge from textile finishing factories | 0.07 |
| OC | 1,1,1-Trichloroethane | 0.2 | Liver, nervous system, or circulatory problems | Discharge from metal degreasing sites and other factories | 0.2 |
| OC | 1,1,2-Trichloroethane | 0.005 | Liver, kidney, or immune system problems | Discharge from industrial chemical factories | 0.003 |
| OC | Trichloroethylene | 0.005 | Liver problems; increased risk of cancer | Discharge from metal degreasing sites and other factories | zero |

**LEGEND**

- D — Disinfectant
- DBP — Disinfection Byproduct
- IOC — Inorganic Chemical
- M — Microorganism
- OC — Organic Chemical
- R — Radionuclides

| Contaminant | MCL or TT[1] (mg/L)[2] | Potential health effects from long-term[3] exposure above the MCL | Common sources of contaminant in drinking water | Public Health Goal (mg/L)[2] |
|---|---|---|---|---|
| M Turbidity | TT[7] | Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause short term symptoms such as nausea, cramps, diarrhea, and associated headaches. | Soil runoff | n/a |
| R Uranium | 30µg/L | Increased risk of cancer, kidney toxicity | Erosion of natural deposits | zero |
| OC Vinyl chloride | 0.002 | Increased risk of cancer | Leaching from PVC pipes; discharge from plastic factories | zero |
| M Viruses (enteric) | TT[7] | Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps) | Human and animal fecal waste | zero |
| OC Xylenes (total) | 10 | Nervous system damage | Discharge from petroleum factories; discharge from chemical factories | 10 |

LEGEND

| | | | | | |
|---|---|---|---|---|---|
| D | Disinfectant | IOC | Inorganic Chemical | OC | Organic Chemical |
| DBP | Disinfection Byproduct | M | Microorganism | R | Radionuclides |

# NOTES

**1** Definitions

- Maximum Contaminant Level Goal (MCLG)—The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
- Maximum Contaminant Level (MCL)—The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
- Maximum Residual Disinfectant Level Goal (MRDLG)—The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- Maximum Residual Disinfectant Level (MRDL)—The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- Treatment Technique (TT)—A required process intended to reduce the level of a contaminant in drinking water.

**2** Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

**3** Health effects are from long-term exposure unless specified as short-term exposure.

**4** Each water system must certify annually, in writing, to the state (using third-party or manufacturers certification) that when it uses acrylamide and/or epichlorohydrin to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05 percent dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01 percent dosed at 20 mg/L (or equivalent).

**5** Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10 percent of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

**6** A routine sample that is fecal coliform-positive or *E. coli*-positive triggers repeat samples--if any repeat sample is total coliform-positive, the system has an acute MCL violation. A routine sample that is total coliform-positive and fecal coliform-negative or *E. coli*-negative triggers repeat samples--if any repeat sample is fecal coliform-positive or *E. coli*-positive, the system has an acute MCL violation. See also Total Coliforms.

**7** EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- *Cryptosporidium*: 99 percent removal for systems that filter. Unfiltered systems are required to include Cryptosporidium in their existing watershed control provisions.
- Giardia lamblia: 99.9 percent removal/inactivation
- Viruses: 99.99 percent removal/inactivation
- *Legionella*: No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated according to the treatment techniques in the surface water treatment rule, *Legionella* will also be controlled.
- Turbidity: For systems that use conventional or direct filtration, at no time can turbidity (cloudiness of water) go higher than 1 nephelolometric turbidity unit (NTU), and samples for turbidity must be less than or equal to 0.3 NTU in at least 95 percent of the samples in any month. Systems that use filtration other than conventional or direct filtration must follow state limits, which must include turbidity at no time exceeding 5 NTU.
- HPC: No more than 500 bacterial colonies per milliliter
- Long Term 1 Enhanced Surface Water Treatment; Surface water systems or ground water systems under the direct influence of surface water serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).
- Long Term 2 Enhanced Surface Water Treatment; This rule applies to all surface water systems or ground water systems under the direct influence of surface water. The rule targets additional *Cryptosporidium* treatment requirements for higher risk systems and includes provisions to reduce risks from uncovered finished water storages facilities and to ensure that the systems maintain microbial protection as they take steps to reduce the formation of disinfection byproducts. (Monitoring start dates are staggered by system size. The largest systems (serving at least 100,000 people) will begin monitoring in October 2006 and the smallest systems (serving fewer than 10,000 people) will not begin monitoring until October 2008. After completing monitoring and determining their treatment bin, systems generally have three years to comply with any additional treatment requirements.)
- Filter Backwash Recycling: The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

**8** No more than 5.0 percent samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli*. If two consecutive TC-positive samples, and one is also positive for *E. coli* or fecal coliforms, system has an acute MCL violation.

**9** Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L)
- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)

# National Secondary Drinking Water Regulation

National Secondary Drinking Water Regulations are non-enforceable guidelines regarding contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, some states may choose to adopt them as enforceable standards.

| Contaminant | Secondary Maximum Contaminant Level |
|---|---|
| Aluminum | 0.05 to 0.2 mg/L |
| Chloride | 250 mg/L |
| Color | 15 (color units) |
| Copper | 1.0 mg/L |
| Corrosivity | noncorrosive |
| Fluoride | 2.0 mg/L |
| Foaming Agents | 0.5 mg/L |
| Iron | 0.3 mg/L |
| Manganese | 0.05 mg/L |
| Odor | 3 threshold odor number |
| pH | 6.5-8.5 |
| Silver | 0.10 mg/L |
| Sulfate | 250 mg/L |
| Total Dissolved Solids | 500 mg/L |
| Zinc | 5 mg/L |

## For More Information

**EPA's Safe Drinking Water Web site:**
**http://www.epa.gov/safewater/**

**EPA's Safe Drinking Water Hotline:**
**(800) 426-4791**

**To order additional posters or other ground water and drinking water publications, please contact the National Service Center for Environmental Publications at :**
**(800) 490-9198, or**
**email: nscep@bps-lmit.com.**

United States Environmental Protection Agency

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# Appendix B: CIP Inflation Adjusted Cost & Schedule

**Appendix B**

Detailed List of Capital Improvements - 3 Percent Inflation Rate

| Description | 2018 Cost | Year Planned | Frequency (yrs) | Inflation Rate | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exterior** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Exterior Lights | $ 10,000 | 2033 | 15 | 3% | | | | | | | | | | | | | | | | 17,020 | | | | | |
| Seal Exterior Brick | $ 10,000 | 2020 | 10 | 3% | | | 11,590 | | | | | | | | | | 15,580 | | | | | | | | |
| Treatment Facility Roof Replacement | $ 30,000 | 2020 | 20 | 3% | | | 34,780 | | | | | | | | | | | | | | | | | | |
| Exterior Doors, Handrailing, and Hardware | $ 5,000 | 2020 | 20 | 3% | | | 5,800 | | | | | | | | | | | | | | | | | | |
| **Reclaim Tank** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reclaim Tank Structure | - | - | - | 3% | | | | | | | | | | | | | | | | | | | | | |
| Reclaim Tank Valves and Actuators | $ 50,000 | 2048 | 40 | 3% | | | | | | | | | | | | | | | | | | | | | |
| Reclaim Return Pump | $ 5,000 | 2028 | 20 | 3% | | | | | | | | | | | 7,340 | | | | | | | | | | |
| Reclaim Sludge Pump | $ 5,000 | 2028 | 20 | 3% | | | | | | | | | | | 7,340 | | | | | | | | | | |
| **Well No. 1** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Casing | $ 50,000 | 2058 | 30 | 3% | | | | | | | | | | | | | | | | | | | | | |
| Pump | $ 20,000 | 2028 | 20 | 3% | | | | | | | | | | | 29,370 | | | | | | | | | | |
| Valves and Flow Meter | $ 20,000 | 2038 | 20 | 3% | | | | | | | | | | | | | | | | | | | | | 39,470 |
| **Well No. 2** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Casing | $ 50,000 | 2058 | 50 | 3% | | | | | | | | | | | | | | | | | | | | | |
| Pump | $ 20,000 | 2028 | 20 | 3% | | | | | | | | | | | 29,370 | | | | | | | | | | |
| Valves and Flow Meter | $ 20,000 | 2038 | 30 | 3% | | | | | | | | | | | | | | | | | | | | | 39,470 |
| Building | $ 6,000 | 2037 | 20 | 3% | | | | | | | | | | | | | | | | | | | | 11,500 | |
| Backup Generator and Transfer Switch | $ 50,000 | 2030 | 30 | 3% | | | | | | | | | | | | | 77,900 | | | | | | | | |
| **Filter Room** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blow-off valve | $ 5,000 | 2048 | 40 | 3% | | | | | | | | | | | | | | | | | | | | | |
| Aerator | $ 55,000 | 2038 | 30 | 3% | | | | | | | | | | | | | | | | | | | | | 108,550 |
| Aerator media | $ 2,000 | 2023 | 15 | 3% | | | | | | 2,530 | | | | | | | | | | | | | | | 3,950 |
| Aerator bypass valve | $ 5,000 | 2048 | 40 | 3% | | | | | | | | | | | | | | | | | | | | | |
| Detention tank paint | $ 4,000 | 2028 | 20 | 3% | | | | | | | | | | | 5,870 | | | | | | | | | | |
| Filter structure | -- | - | - | 3% | | | | | | | | | | | | | | | | | | | | | |
| Filter media | $ 20,000 | 2020 | 12 | 3% | | | 23,190 | | | | | | | | | | | | 33,060 | | | | | | |
| Filter paint | $ 10,000 | 2020 | 10 | 3% | | | 11,590 | | | | | | | | | | 15,580 | | | | | | | | |
| Filter level transducers | $ 10,000 | 2028 | 20 | 3% | | | | | | | | | | | 14,690 | | | | | | | | | | |
| Filter piping and valves | $ 125,000 | 2048 | 40 | 3% | | | | | | | | | | | | | | | | | | | | | |
| Filter valve actuators | $ 40,000 | 2038 | 30 | | | | | | | | | | | | | | | | | | | | | | |
| Blower control valves | $ 10,000 | 2028 | 20 | 3% | | | | | | | | | | | 14,690 | | | | | | | | | | |
| Dehumidifiers | $ 6,000 | 2023 | 15 | 3% | | | | | | 7,600 | | | | | | | | | | | | | | | 11,840 |
| Sump pumps | $ 2,000 | 2028 | 20 | 3% | | | | | | | | | | | 2,940 | | | | | | | | | | |
| Air compressor | $ 25,000 | 2038 | 30 | 3% | | | | | | | | | | | | | | | | | | | | | 49,340 |
| Piping | $ 100,000 | 2048 | 40 | 3% | | | | | | | | | | | | | | | | | | | | | |
| Filter room paint | $ 10,000 | 2023 | 15 | 3% | | | | | | 12,670 | | | | | | | | | | | | | | | 19,740 |
| Filter room unit heaters | $ 8,000 | 2023 | 10 | 3% | | | | | | 10,130 | | | | | | | | | | 13,620 | | | | | |
| Filter room lighting | $ 5,000 | 2023 | 15 | 3% | | | | | | 6,330 | | | | | | | | | | | | | | | 9,870 |
| **Pump Room** | | | | | | | | | | | | | | | | | | | | | | | | | |
| High service pump 1 | $ 60,000 | 2028 | 20 | 3% | | | | | | | | | | | 88,110 | | | | | | | | | | |
| High service pump 2 | $ 60,000 | 2028 | 20 | 3% | | | | | | | | | | | 88,110 | | | | | | | | | | |
| High service pump piping and valves | $ 50,000 | 2048 | 40 | 3% | | | | | | | | | | | | | | | | | | | | | |
| Backwash pump | $ 50,000 | 2028 | 20 | 3% | | | | | | | | | | | 73,430 | | | | | | | | | | |
| Backwash pump piping and valves | $ 25,000 | 2048 | 40 | 3% | | | | | | | | | | | | | | | | | | | | | |
| Flow meters | $ 15,000 | 2028 | 20 | 3% | | | | | | | | | | | 22,030 | | | | | | | | | | |
| Blower | $ 30,000 | 2028 | 20 | 3% | | | | | | | | | | | 44,060 | | | | | | | | | | |
| Clearwell structure | -- | - | - | 3% | | | | | | | | | | | | | | | | | | | | | |
| Clearwell piping and valves | $ 30,000 | 2048 | 40 | 3% | | | | | | | | | | | | | | | | | | | | | |
| Clearwell level transducer | $ 10,000 | 2023 | 15 | 3% | | | | | | 12,670 | | | | | | | | | | | | | | | 19,740 |
| Pump room dehumidifier | $ 3,000 | 2023 | 15 | 3% | | | | | | 3,800 | | | | | | | | | | | | | | | 5,920 |
| Pump room unit heaters | $ 8,000 | 2023 | 15 | 3% | | | | | | 10,130 | | | | | | | | | | | | | | | 15,790 |
| Pump room lighting | $ 5,000 | 2023 | 15 | 3% | | | | | | 6,330 | | | | | | | | | | | | | | | 9,870 |
| **Electrical and Generator Rooms** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Motor control center and breakers | $ 150,000 | 2023 | 15 | 3% | | | | | | 190,020 | | | | | | | | | | | | | | | 296,040 |
| Instrumentation/Control Updates | $ 20,000 | 2023 | 6 | 3% | | | | | | 25,340 | | | | | | 30,250 | | | | | 36,120 | | | | |
| Electrical room unit heater | $ 1,000 | 2023 | 15 | 3% | | | | | | 1,270 | | | | | | | | | | | | | | | 1,970 |
| Electrical room lights | $ 5,000 | 2023 | 15 | 3% | | | | | | 6,330 | | | | | | | | | | | | | | | 9,870 |
| Backup generator major overhaul | $ 30,000 | 2038 | 20 | 3% | | | | | | | | | | | | | | | | | | | | | 59,210 |
| **Chemical Rooms** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluoride storage tank | $ 8,000 | 2023 | 15 | 3% | | | | | | 10,130 | | | | | | | | | | | | | | | 15,790 |
| Fluoride tank scale | $ 3,000 | 2023 | 15 | 3% | | | | | | 3,800 | | | | | | | | | | | | | | | 5,920 |
| Fluoride metering pumps and accessories | $ 5,000 | 2023 | 5 | 3% | | | | | | 6,330 | | | | | 7,340 | | | | | 8,510 | | | | | 9,870 |
| Orthophosphate storage tank | $ 8,000 | 2023 | 15 | 3% | | | | | | 10,130 | | | | | | | | | | | | | | | 15,790 |
| Orthophosphate tank scale | $ 3,000 | 2023 | 15 | 3% | | | | | | 3,800 | | | | | | | | | | | | | | | 5,920 |

**Appendix B**

Detailed List of Capital Improvements - 3 Percent Inflation Rate

| Description | 2018 Cost | Year Planned | Frequency (yrs) | Inflation Rate | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Orthophosphate metering pump and accessories | $ 5,000 | 2023 | 5 | 3% | | | | | | 6,330 | | | | | 7,340 | | | | | 8,510 | | | | | 9,870 |
| Permanganate storage tank | $ 8,000 | 2023 | 15 | 3% | | | | | | 10,130 | | | | | | | | | | | | | | | 15,790 |
| Permanganate tank scale | $ 3,000 | 2023 | 15 | 3% | | | | | | 3,800 | | | | | | | | | | | | | | | 5,920 |
| Permanganate metering pump and accessories | $ 5,000 | 2023 | 5 | 3% | | | | | | 6,330 | | | | | 7,340 | | | | | 8,510 | | | | | 9,870 |
| Drench shower and eyewash | $ 3,000 | 2028 | 20 | 3% | | | | | | | | | | | 4,410 | | | | | | | | | | |
| Chlorine tank scales | $ 5,000 | 2023 | 15 | 3% | | | | | | 6,330 | | | | | | | | | | | | | | | 9,870 |
| Chlorine rotameter, piping, and valves | $ 10,000 | 2020 | 12 | 3% | | | 11,590 | | | | | | | | | | | | 16,530 | | | | | | |
| Chlorine booster pump | $ 8,000 | 2020 | 12 | 3% | | | 9,270 | | | | | | | | | | | | 13,220 | | | | | | |
| Dehumidifier | $ 3,000 | 2023 | 15 | 3% | | | | | | 3,800 | | | | | | | | | | | | | | | 5,920 |
| Chemical room unit heater | $ 8,000 | 2028 | 10 | 3% | | | | | | | | | | | 11,750 | | | | | | | | | | 15,790 |
| Chemical room lighting | $ 5,000 | 2023 | 15 | 3% | | | | | | 6,330 | | | | | | | | | | | | | | | 9,870 |
| **Mechanical Room** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water heater | $ 5,000 | 2023 | 15 | 3% | | | | | | 6,330 | | | | | | | | | | | | | | | 9,870 |
| RPZ and other valves | $ 10,000 | 2028 | 20 | 3% | | | | | | | | | | | 14,690 | | | | | | | | | | |
| Mechanical room unit heater | $ 1,000 | 2020 | 12 | 3% | | | 1,160 | | | | | | | | | | | | 1,650 | | | | | | |
| **Office and Laboratory** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Office SCADA computer | $ 3,000 | 2023 | 5 | 3% | | | | | | 3,800 | | | | | 4,410 | | | | | 5,110 | | | | | 5,920 |
| Laboratory equipment | $ 5,000 | 2023 | 5 | 3% | | | | | | 6,330 | | | | | 7,340 | | | | | 8,510 | | | | | 9,870 |
| **Water Tower** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tower Painting Rehabilitation | $ 200,000 | 2020 | 15 | 3% | | | 231,850 | | | | | | | | | | | | | | | 361,220 | | | |
| **TOTAL ESTIMATED ANNUAL COST** | | | | | **$0** | **$0** | **$340,820** | **$0** | **$0** | **$388,850** | **$0** | **$0** | **$0** | **$0** | **$491,970** | **$30,250** | **$109,060** | **$0** | **$64,460** | **$69,790** | **$0** | **$397,340** | **$0** | **$11,500** | **$862,490** |