Water Production Division

Water That is Second to None

2017
Winner of the Best Tasting Water in Kane County!
Slideshow Overview

- General City of Aurora, IL Information
- Aurora Public Water Supply History
- Description of Current Facilities & Operations
- Recent Activities
  - 2012 Drought
  - Water Conservation Ordinance – Effectiveness?
  - Internal Initiatives and Cost-Saving Measures
Aurora, IL – General Information

- 2020 Population = 202,000
- 2nd Largest City in IL
- Extends into 4 counties: Kane, DuPage, Kendall & Will
Water Production Division
Mission Statement

To provide the City of Aurora with a reliable supply of safe, high-quality water at adequate pressure for fire suppression, in a cost-effective manner, and in full compliance with regulatory requirements; and, to manage the expansion of water supply infrastructure needed to effectively support the growth and development of the City of Aurora.
History of Public Water Supply System

Late 1840’s

- Samuel McCarty constructed first system
  - Raw Water Source = Natural Springs
- Wooden water main fed downtown by gravity
History of Public Water Supply System

1880’s

- 20-foot deep channel on island in Fox River
  - Natural gravel of island filtered raw river water
- 1889 Average Day Demand = 0.8 MGD
History of Public Water Supply System
1895 thru 1929

- Fox River source abandoned in 1892
  - City drilled first deep well = 1,400 feet deep
- 1895 Average Day Demand = 1.96 MGD
- By 1929 the city had 12 deep wells
- Continued growth required long-term planning
  - Triggered 1933 Water Works Improvement Program
History of Public Water Supply System

1933 Water Works Program

- 1.5 MG Hill Ave. Water Tower (demolished in 2012)
- 9 MGD Main Pump Station constructed
- Several miles of 12”, 14”, and 16” water mains
History of Public Water Supply System

1963

- Major turning point for the growth of the city
- Construction of the East-West Tollway (now I-88)
- Lead to the 1986 Water System Master Plan
History of Public Water Supply System

1989 Water System Improvements

• Planning for expected rapid growth of city
• Major shift in way residents receive potable water
• City decided against using Lake Michigan water
• Use three raw water sources blended together
  – Fox River, Deep wells & Shallow wells
• Well Collector pipelines – transport well water to WTP
• Fox River water also pumped to WTP
• All water receives full surface water level treatment
• Two transmission mains move water to system edges
History of Public Water Supply System

1989 Water System Improvements

- 28 MGD Lime Softening Water Treatment Plant
- River Intake Pump Station – 17 MGD capacity
- Drilled Additional wells to increase well capacity
History of Public Water Supply System

2002 Water System Improvements

- WTP Capacity increased to 42 MGD
- River Intake Capacity increased to 27 MGD
- Deep and Shallow wells added to raw sources
Aurora Water Production Division
Water Treatment Plant - Current

• Current Configuration
  • Capacity = 42 MGD
  • 5 Claricones; 12 Filters; 6.3 MG Clearwell Capacity
  • 15 Deep Wells; 6 Shallow Wells; 27 MGD River Capacity
Aurora Water Production Division

Basic Facts

• Total Number of Staff = 29
• Annual Operating Expenditures = $10.6 Mill. (avg.)
• Total Facility Sites = 25
• WTP Manned 24 hours/day, 365 days/year

• Average Daily Flow = 16.4 MGD
• Summer Avg. Daily Flow = 18.3 MGD
• Fall/Winter/Spring Avg. Daily Flow = 15.5 MGD
• Raw Water Use: 55% Fox River / 45% Well Water
Water Production Division
Remote Facilities

- Finished Water Storage
  - Capacity = 17.5 MG
  - 4 Ground Level Tanks; 2 Standpipes; 3 Elevated Tanks
- Wells
  - 12 Deep Wells; Depth > 1,100 ft; Capacity = 16 MGD
  - 6 Shallow Wells; Depth < 300 ft; Capacity = 5 MGD
  - 3 Emergency/Back-up Deep Wells; Capacity = 5 MGD
Process flow diagram for the Aurora Water Treatment Facility.
WTP Claricones

Claricones: 60+ foot diam.

Rapid Mix, Coagulation, Flocculation, Clarification & Softening in Same Vessel

Rated Capacity:
4 @ 7 MGD each
1 @ 8.5 MGD
Helical Upflow Solids Contact Clarifier
WTP Recarbonation Tanks

Recarb Tanks:
- Stabilizes Water
- Stops Softening Rxns
- CO$_2$ Addition - Acidic
- Reduces pH to 9.0
- Convert OH$^-$ → HCO$_3^-$

Rated Capacity:
3 @ 14 MGD each
WTP Filters with GAC

8 - Conventional Gravity Filters
4 - Decelerating Gravity Filters

Filtration Media:
60” GAC
24” Filter Sand

Support Media

Individual Filter
Turbidity Goals:
≤ 0.10 NTU

Capacity:
12 @ 5 gpm/sq.ft.
WTP Disinfection Clearwells

Purpose:
Surface Water Treatment Disinfection Requirements

- Use Sodium Hypochlorite
- Log Inactivation Values
  - Giardia & Viruses

Capacity:
1 @ 4 MG (Baffled)
2 @ 1.13 MG (Ribbon-Flow)
WTP Pump Station

Chloramination:
Ammonia Added to Convert Free Chlorine to Chloramines

Two Pressure Systems
High & Normal

Vertical Turbine Pumps

Capacity:
6 NPS pumps – 200hp = 24 MGD
3 HPS pumps – 100hp = 5 MGD

3 Filter Backwash Pumps – 100hp
SCADA System

- System Upgrade in 2010
- Monitor WTP & System
- Security System
- Video Monitoring of sites
- Flow-Pacing of Chemicals
- Automatic Reports

Continue to Leverage Hardware for Increased Capabilities
WTP Microbiology Laboratory

- IDPH Certified Lab since 2005
- IEPA State Contract Lab - 2013
  - 300 monthly samples
Fox River Monitoring
  - Algal Blooms & Toxins
Distribution System Monitoring
  - Routine Sampling
WTP Chemistry Laboratory

- Daily Bench Chemistry
  - Over 15 parameters
- 80+ online analyzers
- Collect regulatory samples

- Surface Water Monitoring
  - Raw Fox River water
  - Increases reaction time
WTP By-Product
Lime Sludge

- 5 Onsite Dewatering Lagoons
- Daily Management by staff
- Filling Time: 15 to 60 days
- Recent Year Data:
  - 40,000 Wet Tons per Year
  - Disposal: $1.5 Million per yr
• Water Treatment Plant by-product used as agricultural soil amendment
• Land application in 2012 was first time in City’s history
Partnership for Safe Water

• Voluntary optimization program
  – Perform better than federal drinking water regs.
  – Received Presidents Award for 2014 thru 2020
  • Received Directors Award from 2010 through 2020
  – Achieved PSW standards through 2012 drought
2012 Drought

- Total Water Pumped to Residents:
  - July 2012 – 2nd Highest Month in City’s History
  - 4-Month Period of May through August 2012
    - 2nd Highest 4-month period in City’s History
Drought Comparison

Basic Comparison of 2012 Drought to 2005 Drought

**Time Period:** May 1\textsuperscript{st} thru July 10\textsuperscript{th}

<table>
<thead>
<tr>
<th></th>
<th>2005 Drought</th>
<th>2012 Drought</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation Total</td>
<td>3.50 inches</td>
<td>3.64 inches</td>
</tr>
<tr>
<td>Avg. Daily Ambient Temp</td>
<td>78.5 F</td>
<td>81.9 F</td>
</tr>
<tr>
<td>Baseline Flows (Jan - Apr)</td>
<td>15.1 MGD</td>
<td>15.3 MGD</td>
</tr>
<tr>
<td>Avg. Daily Flows</td>
<td>20.9 MGD</td>
<td>21.1 MGD</td>
</tr>
<tr>
<td>Maximum One-Day Flow</td>
<td>28.6 MGD</td>
<td>27.3 MGD</td>
</tr>
<tr>
<td>Days with Flows &gt;25MGD</td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td>City Population (est.)</td>
<td>168,181</td>
<td>197,899</td>
</tr>
</tbody>
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• 17.7% population INCREASE between 2005 and 2012
National Plumbing Fixture Regulations

Per Person Analysis

- **Maximum Day Usage Per Person**
- **Average Day Usage Per Person**

**Graph Details:**
- **x-axis:** Year (1986 to 2010)
- **y-axis:** Usage Per Person Per Day (gpppd)
- **Legend:**
  - Red line: Maximum Day Usage Per Person
  - Green line: Average Day Usage Per Person

**Key Points:**
- A declining trend in usage per person per day starting in 2004.
- A significant drop in usage per person per day after the new federal plumbing regulations became effective in 2004.

**New Federal Plumbing Regulations Become Effective**

- The graph shows a sharp decline in average usage per person per day after this date.
Water Conservation Ordinance
Enacted in 2006 – Amended in 2013

• **Current Ordinance**: - Sect. 48-31
  – Revised in 2013
  – Even / Odd style based on home address
  – Watering permitted 6-9am and 6-9pm on day
  – Sod installation **prohibited** in July and August
    • Special sod watering permit allowed rest of year
  – Permanently installed systems follow same times

– Watering **NOT** permitted on July 31st and August 31st
• Reduced peak summer-time demand by 20 gallons per person per day
Northwest Water Planning Alliance

Goal: Provide a sustainable water supply for the NWPA region in a manner that is both economically and environmentally sound

- Formed by IGA in September 2010
- Groundwater and inland surface water communities
- 79 Communities; 5 Counties; 1.4 million people
- Executive Comm.: 14 Public Officials (COG’s & Counties)
- Technical Advisory Comm.: Water Professionals
Why?

- Communities withdraw water from same resources
  - Resources do not follow municipal boundaries; Competition
- Inconsistencies between NWPA member’s ordinances
  - Residents on opposite sides of street follow different guidelines
- Studied actual water needs of Midwestern lawns
- Deep aquifer withdrawals exceeding recharge rates
  - Exterior use of water is discretionary
• Reduces electricity consumption and conserves sensitive deep aquifer
• Estimated annual savings of $200,000 compared to baseline in 2007
Fox River Taste & Odor Events

- Natural algae byproducts in Fox River
- Completely safe to drink; only aesthetic quality issue
- Treatment methods remove compounds
  - Additional chemicals used increase treatment costs
- June/July 2016
  - 2-Methylisoborneol (MIB)
    - Earthy, musty taste
- Sept/Oct 2017
  - Geosmin
    - Dirt, muddy taste
**Well Use Schedule**

<table>
<thead>
<tr>
<th>Well Number</th>
<th>Schedule</th>
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</thead>
<tbody>
<tr>
<td>28</td>
<td>First ON / Last OFF</td>
</tr>
<tr>
<td>29</td>
<td>(most efficient)</td>
</tr>
<tr>
<td>20</td>
<td></td>
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<tr>
<td>27</td>
<td></td>
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<td>23</td>
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<td>21</td>
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<tr>
<td>17</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>(least efficient)</td>
</tr>
<tr>
<td>15</td>
<td>Last ON / First OFF</td>
</tr>
</tbody>
</table>

- Most efficient wells are used most often; Reduces electrical consumption
- Estimated annual savings of $100,000 compared to baseline in 2009
Water-Source Heat Pump System

- Raw well water used as heat-source or heat-sink thru heat exchanger for HVAC system
- Water then treated & used for potable supply (original purpose)

- Most economical alternative over life expectancy of units
- Carbon emissions reduced – no natural gas combustion
- IL Chapter ASHRAE – Excellence in Engineering Award
Best Tasting Water Awards

• **Kane County Water Association:**

• **IL Section – American Water Works Association:**
Aurora Water Production Division