Minnesota municipalities are wrestling with high chloride levels in their wastewater. Chloride is one of the components of salt, which is used in forms such as sodium chloride (table salt), calcium chloride and magnesium chloride (road salts). Sodium chloride is commonly used in home water softeners and by water treatment plants to treat “hard” water. Minnesota generally has groundwater with high levels of calcium and magnesium that must be removed through softening in order to improve taste and prevent lime scale buildup in appliances, pipes and water fixtures. The majority of home water softeners use sodium chloride (NaCl) in a softening process that replaces calcium and magnesium ions with sodium, while the chloride ions are discharged in the wastewater and eventually end up in the environment.

High chloride use can lead to environmental issues. Chloride released into local lakes and streams does not break down, and instead accumulates in the environment, potentially reaching levels that are toxic to aquatic wildlife and plants. Because salt water is more dense than fresh water, it settles at the bottom of lakes potentially preventing the natural mixing of oxygen and nutrients and in effect creating a “dead zone.”

The Minnesota Pollution Control Agency (MPCA) has authority to require discharges to comply with water quality standards using the Clean Water Act and National Pollutant Discharge Elimination System (NPDES) permits. This ensures the protection of aquatic plants, invertebrates and fish. Compliance schedules and variances can be used to assist in meeting permit requirements. Both permitting tools allow time to comply with the permit; however, the variance process considers economic factors that allow more flexible timelines, and offers the potential for renewal of a variance if the permit goal remains unachievable. The variance process may take longer than a compliance schedule and requires approval by the Environmental Protection Agency (EPA). Each community needs to determine which tool is appropriate for their situation.

Communities Addressing Chloride Case Study: Jordan, MN

The problem:
Wastewater discharged: Sand Creek

The solution:
Ordinance regulating water softening

Main implementation challenge:
City Council felt it was too intrusive, ordinance was tabled and never brought up again.
Jordan background

The City wastewater treatment plant discharges to Sand Creek, a tributary of the Minnesota River. Sand Creek has a 7Q10 (low flow) of 0 at times, therefore there is no dilution allowance. A number of municipalities have been required by the Minnesota Pollution Control Agency (MPCA) to monitor “salty discharge”, which includes chloride, hardness and several other parameters. Jordan has been monitoring salty discharge since 2010. Average monthly chloride values range from the mid 300’s up to over 750 mg/L, well over the 250 mg/l standard. The City anticipates future NPDES permit limits for chloride.

City Demographics

<table>
<thead>
<tr>
<th>Total Population</th>
<th>Number of Households</th>
<th>Median Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>6,150</td>
<td>2,099</td>
<td>$68,091</td>
</tr>
</tbody>
</table>

The City of Jordan is located in Scott County and has approximately 6,150 residents. Jordan obtains its raw water supply from three wells ranging from 287 to 547 feet deep, drawing water from the Tunnel City-Wonewoc sandstone and Mt. Simon sandstone aquifers. One of the wells is classified as an emergency rather than primary source well. Water hardness in Jordan is 24 grains per gallon. To manage the hard water, many if not most residents use water softeners. The recommended water hardness level for taste and to prevent the buildup of lime on pipes and home appliances is less than 5 grains, though many homeowners prefer levels closer to 0 grains.

Solution

An ordinance regulating water softening was the only alternative considered.

Project Description

In 2014, the City of Jordan prepared a draft ordinance and the City Council discussed adoption of the ordinance regulating the use of water softeners. “The purpose of the water softener control program is to: (1) protect the health, safety and welfare of the citizens of Jordan and its waterways through the regulation of the discharge of sodium products into the Jordan sanitary sewer system and the City’s wastewater treatment plant (WWTP); (2) to regulate the use of self-generating water softeners using sodium based products because such systems represent the most significant controllable source of sodium ultimately entering into the WWTP; and (3) to limit or decrease the costs for treatment for sodium removal from the WWTP.”

The ordinance refers to sodium as the problem rather than chloride. It would apply to new and replacement softeners installed in a residential or commercial principal building, or accessory building. The ordinance requires use of “self-generating water softeners”, those that recharge based on water use rather than time. It also specifies a salt efficiency rating of no less than 2,900 grains of hardness removed per pound of salt used in regeneration. The draft ordinance states that water used for landscape irrigation shall not be treated.
Results

The City Council discussed the proposed ordinance on December 1, 2014 and initially tabled it for more information. At the December 15, 2014 meeting it was stated that the timer-based softeners were hard to purchase, and most are already on-demand softeners. This implies that there might not be a need for the ordinance as written. The ordinance was again tabled and has not been discussed since then.

References


Minnesota State Demographic Center. City and Township Data from the U.S. Census Bureau 2010-2014 American Community Survey.


November 2016.


Walsh, Jim, Minnesota Department of Health. Telephone and email correspondence with Source Water Protection, Hydrologist Supervisor December 2, 2016


August 2017

Funding for this project was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources