



STAFF SUMMARY

TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director 
DATE: February 19, 2020
SUBJECT: Chloride Trends in MWRA Reservoirs: Best Management Practices to Reduce Water Quality Impacts

COMMITTEE: Water Policy & Oversight

 X INFORMATION
 VOTE

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Preparer/Title


David W. Coppes, P.E.
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RECOMMENDATION:

For information only.

DISCUSSION:

Chloride concentrations have been increasing throughout the northeastern United States resulting in water quality changes in freshwater bodies, streams, and groundwater. Department of Conservation & Recreation (DCR) Division of Water Supply Protection and MWRA staff are monitoring the rising chloride levels in the Quabbin and Wachusett Reservoirs due to road salt application. Elevated chloride levels can increase corrosivity in the water distribution system and impact lead levels, in addition to affecting reservoir aquatic life.

The increase in chloride levels has brought attention to the impact that road salt has on water supplies. Road salt is applied to de-ice roads in the winter for highway safety, with nearly 20 million tons applied annually in most Northeastern and mid-western states¹. Nearly all of the runoff from road salt indirectly enters into drinking water supplies through adjacent rivers, streams and aquifers. DCR estimates approximately 18,340 tons of road salt are applied annually in the Wachusett watershed to parking lots, and state and community roadways.

Massachusetts DEP recommends that public water systems annually monitor for all secondary standard (aesthetic-based) contaminants, including chloride, at their finished water taps. MWRA performs this monitoring quarterly at the Wachusett and Quabbin Reservoir source and finished water taps. Massachusetts has a secondary maximum contaminant limit (SMCL) of 250 mg/L for

¹ Kelsey J. Pieper, Min Tang, C. Nathan Jones, Stephanie Weiss, Andrew Greene, Hisyam Mohsin, Jeffrey Parks, and Marc A. Edwards, Impact of Road Salt on Drinking Water Quality and Infrastructure Corrosion in Private Wells *Environmental Science & Technology* 2018 52 (24), 14078-14087

chloride in drinking water that relates to the water aesthetics and salty taste at concentrations above this level. While MWRA finished water chloride levels are far below the SMCL, MWRA and DCR are monitoring and collaborating to reduce levels in both watersheds. Current treatment processes at the Brusch and Carroll Water treatment plants do not specifically reduce chloride levels in finished water.

Data trends show an increase in raw water chloride and specific conductance at both the Quabbin and Wachusett Reservoirs. Specific conductance is a surrogate measure for chloride, and is an easier measurement allowing for more frequent sampling. Since the 2016 drought, which was followed by a series of large precipitation events, Wachusett Reservoir raw water chloride levels increased. Quabbin Reservoir also shows small, but consistent increases compared to typical ranges recorded prior to 2016. It should be noted that Quabbin transfers help to decrease the specific conductance and chloride levels within the Wachusett Reservoir.

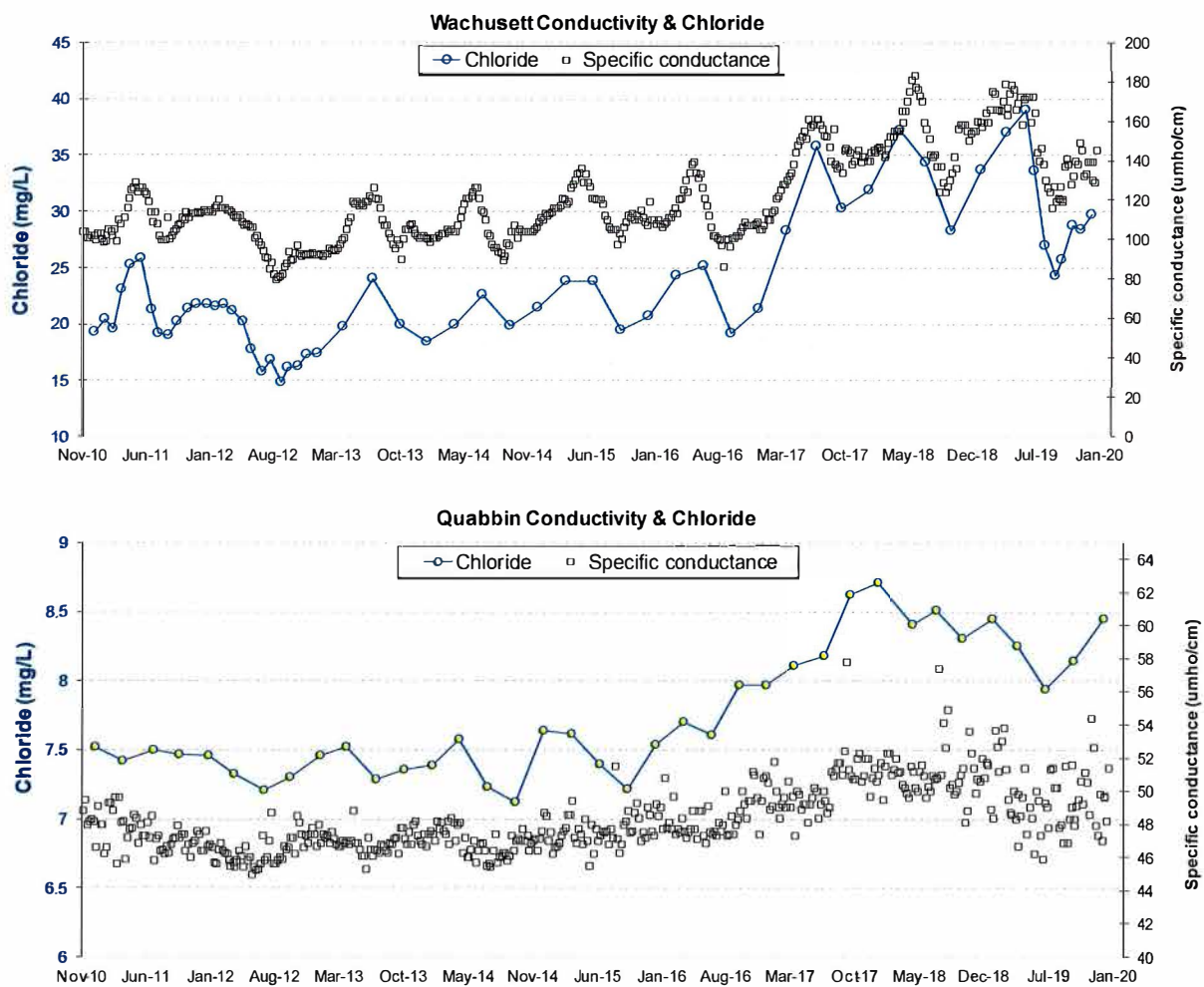


Figure 1. Chloride and specific conductance levels in MWRA’s Wachusett and Quabbin reservoirs.

DCR has also documented significant increases in specific conductance at 30 sampling stations in the Wachusett watershed. Gates Brook, a tributary in a densely developed section of West Boylston, currently accounts for the highest amounts of chloride concentrations. Seasonal increases in chloride concentrations at the Wachusett Reservoir had traditionally been observed

following winter precipitation events. More recent data show that chloride levels are also elevated during the summer, which suggests that groundwater now has elevated levels as well.

To address the elevated loadings of road salt, DCR staff performed a preliminary, but comprehensive review of snow and ice removal practices within the Wachusett Reservoir watershed communities (Boylston, West Boylston, Paxton, Holden, Princeton, Rutland, Sterling, and MassDOT highways). DCR staff requested recent and historic salt use and purchase information; salt equipment application methods; alternative de-icing products; number of employees involved in snow plowing; and community well water quality data. These findings were recently presented by DCR to the Water Supply Protection Trust.

Since proper salt application is integral to decreasing overall salt concentrations on roadways while maintaining road safety, MWRA funded a training for watershed-community DPW staff. The one-day training program, delivered by Baystate Roads at the UMass Transportation Center on November 5, 2019, discussed the proper use of salt and liquid de-icers/anti-icers, pre-wetting and pre-treating operations, and salt equipment calibration. Several DCR and MWRA staff also attended this well-received training event.

Next Steps

DCR staff are working with the community drinking water supply staff to further promote local interest in reduced salt applications and reaching out to communities, like Cambridge and Wellesley, who are dealing with increased chloride levels as well. Collaborative research and modeling efforts are underway with the University of Massachusetts, Amherst to investigate watershed-based reservoir inputs of road salt and predict water quality impacts using hydrodynamic water quality modeling. DCR plans to install data loggers across the watershed to obtain real-time specific conductance data and collect more samples for chloride and specific conductance to track groundwater impacts and help focus management efforts. MWRA is looking for grant opportunities to fund replacement of inefficient salt application equipment within watershed communities.

Staff will continue to monitor chloride and specific conductance levels in the reservoirs. In addition, staff are evaluating the potential downstream impacts, looking specifically at whether they affect lead levels in the distribution system. The data will be used to inform additional actions as we work closely with DCR staff to educate the public and encourage source reduction through road salt application best management practices.