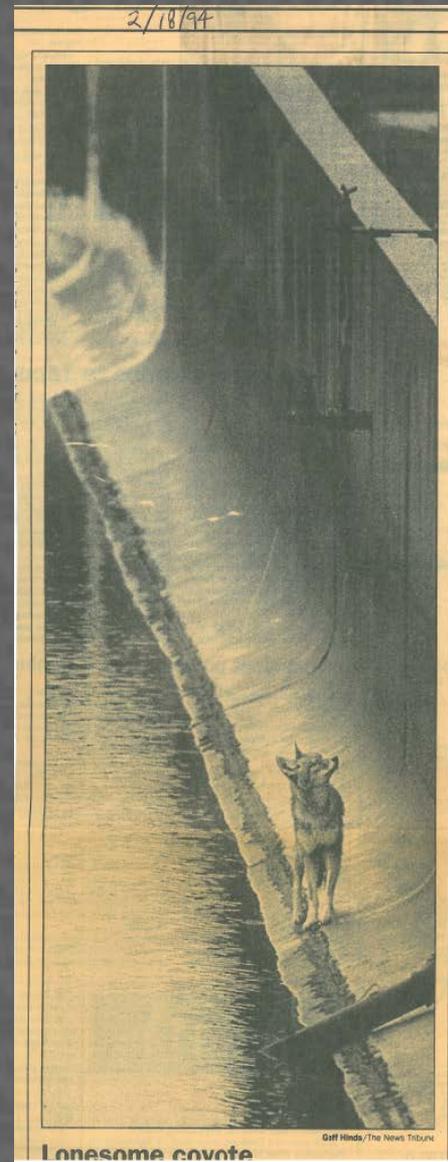


# Ending an Era: The Replacement of Open Finished Water Reservoirs

April 24, 2012

Chris McMeen  
Deputy Superintendent  
Water Quality Manager  
(253) 502 – 8210  
cmcmeen@cityoftacoma.gov



**TACOMA**  **WATER**  
TACOMA PUBLIC UTILITIES

# TACOMA WATER



# TACOMA WATER

- 310,000 direct service population
- Up to 200,000 more people served through regional partnerships and wholesale customers.
- 167 MGD peak treatment capacity from the Green River Supply, an unfiltered, uninhabited -235 mi<sup>2</sup> watershed.
- 55 MGD supplemental supply from urban groundwater supplies.

# REGULATORY LANDSCAPE IN WASHINGTON STATE

## JUNE 23, 1975 - INITIAL DISTRIBUTION SYSTEM RULES BECAME EFFECTIVE.

- No new uncovered reservoirs.
- Existing uncovered reservoirs must be scheduled for covering or replacement unless it met certain standards:
  - Four-log virus disinfection requirement
  - Meet fencing height and setback requirements
  - Operations program & emergency response program.

## AUGUST 1983 - SIMPLIFIED RULES

- All requirements addressed within the scope of a plan of operation.

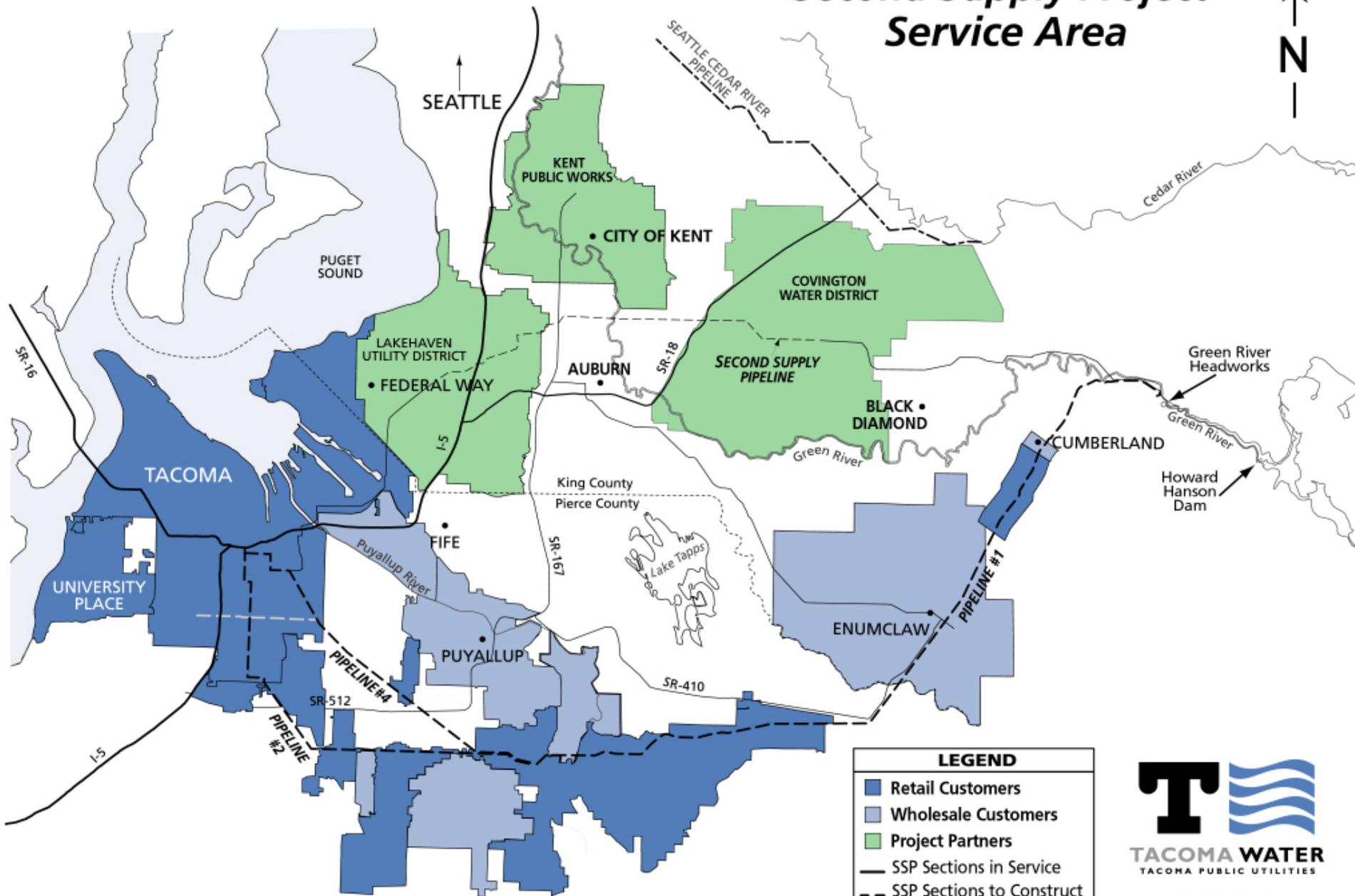
## APRIL 9, 1999 – BEGINNING OF THE END

- Required a department-approved plan for a schedule to cover all uncovered reservoirs.

## JUNE 2006 – LT2

# TACOMA WATER – SYSTEM OVERVIEW

## Second Supply Project Service Area



# WHEN VOLUME & SOLAR DISINFECTION WERE KING

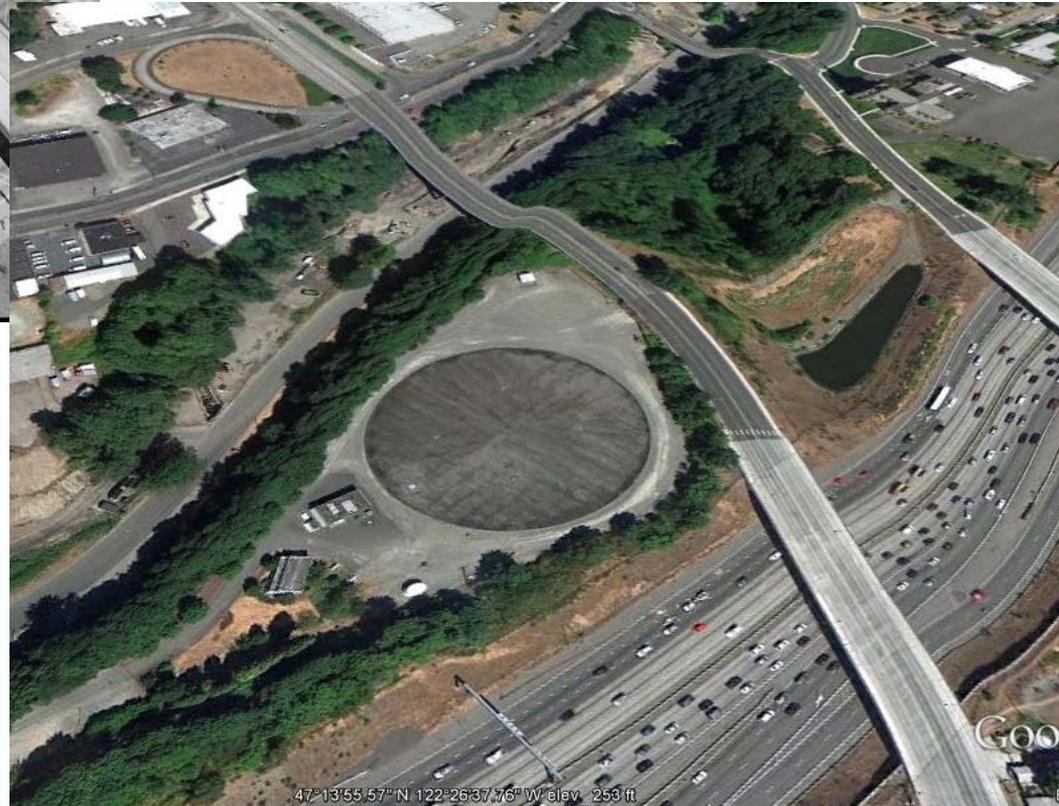


**Hood Street Reservoir  
Replaced 1987**

**Old: 13MG**

**New: 10 MG**

**Cost \$2.7 Million (\$5.7M 2012 Dollars)**



# WHEN VOLUME & SOLAR DISINFECTION WERE KING



**Alaska Street Reservoir  
Replaced 1988  
Old: 9 MG  
New: 6 MG  
Cost \$1 Million (\$2.1M 2012 Dollars)**



# WHEN VOLUME & SOLAR DISINFECTION WERE KING



**North End Reservoir  
Replaced 1990  
Old: 25 MG  
New: 10 MG  
Cost \$2.3 M (\$4.5M 2012 dollars)**



# WHEN VOLUME & SOLAR DISINFECTION WERE KING



**Portland Avenue Reservoir  
Replaced 2003**

**Old: 50 MG**

**New: 20 MG**

**Cost \$7.1 Million (\$8.2 2012 Dollars)**



# WHEN VOLUME & SOLAR DISINFECTION WERE KING



**McMillin Reservoir**  
**Replaced 2012**  
**Old: 210 MG**  
**New: 66 MG**  
**Cost \$32 Million**

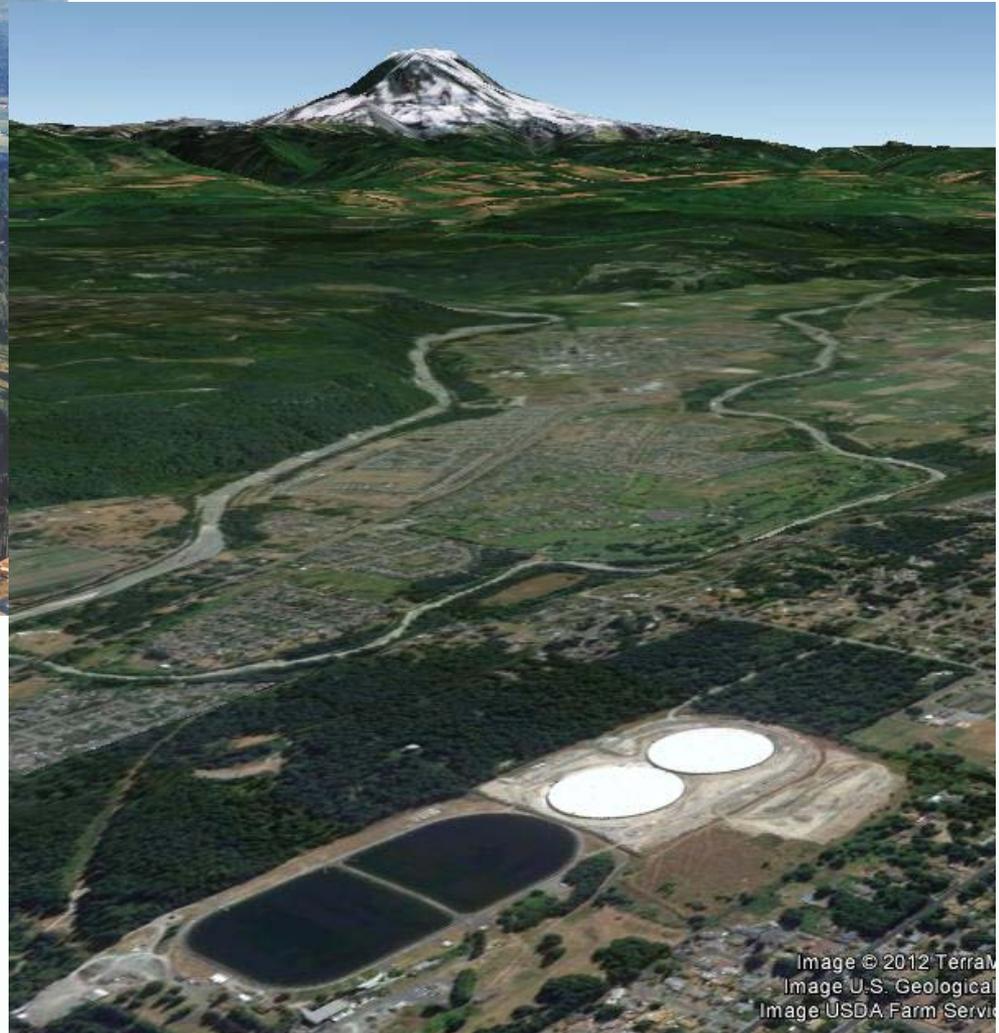


Image © 2012 TerraM  
Image U.S. Geological  
Image USDA Farm Service

# COVERING/REPLACING – WHAT IS THE R.O.I.?

Facility	Old Volume	New Volume	Construction Cost (2012\$)
Hood St	13	10	\$5.7 M
Alaska	9	6	\$2.1 M
North End	25	10	\$4.5 M
Portland Ave	50	20	\$8.2 M
McMillin	210	66	\$32.1 M
		TOTAL:	\$52.6M

**\$52.6M for –195 MG (195 MG) of storage. Interesting Return on Investment**

BUT:

- Four rechlorination stations eliminated; one pending
- Reduced labor for operating & surveillance
- Eliminated Copper sulfate and activated carbon treatments, or reservoir dumps
- Dramatically improved water quality & site security
- Very low microbial risk remains very low
- Compliance achieved

# “THERE ARE WORMS IN MY WATER!”



“Not to worry...they mostly get chopped up in the water meters....”

--Former employee, as quoted in the local press

Bay, E.C. 1993 Chironomid (Diptera: Chironomidae) Larval Occurrence and Transport in a Municipal Water System. J. Am. Mosquito Control Assoc. 9:3:275-284

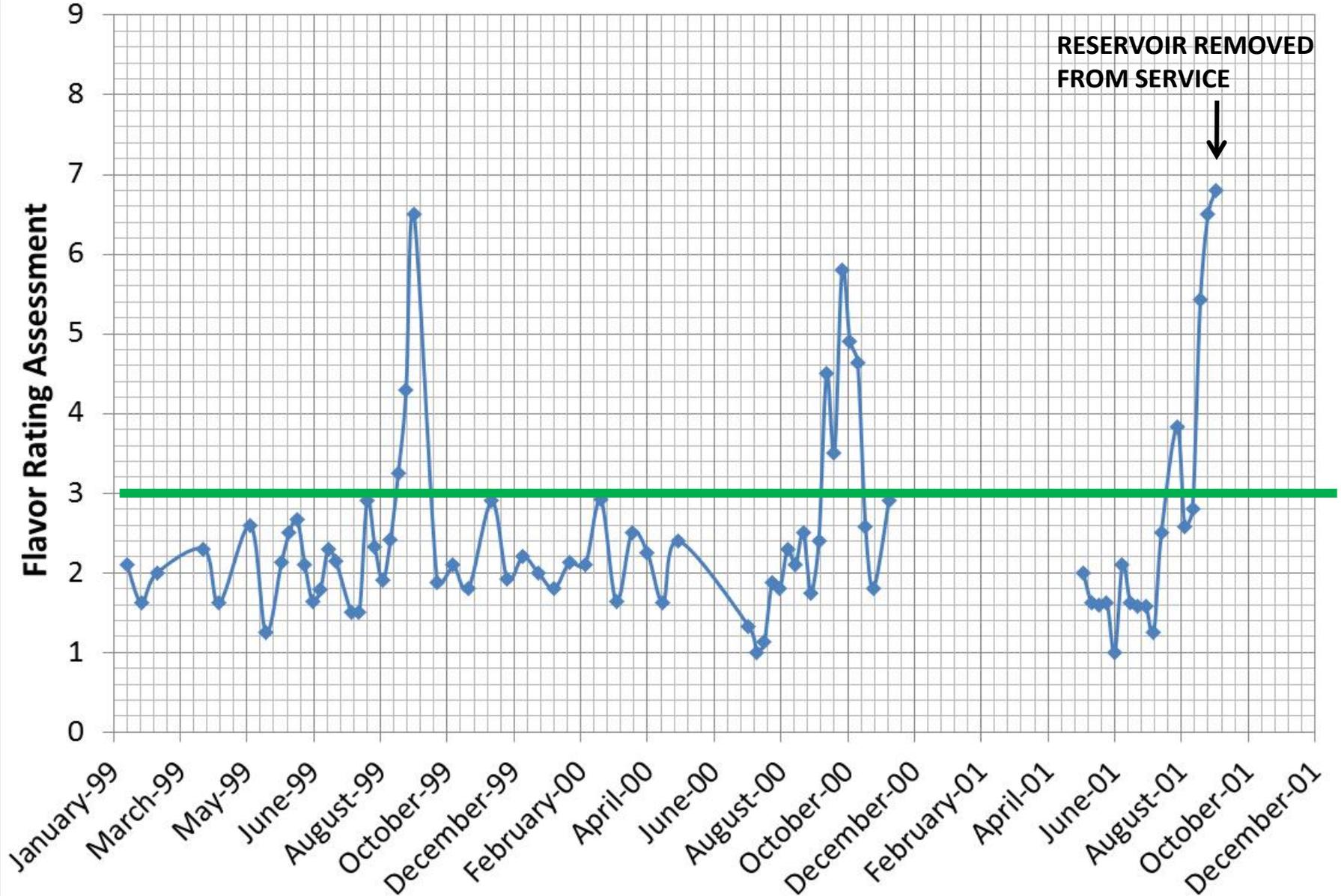
# TASTE & ODOR - ACCEPTABLE PERFORMANCE

## Flavor Rating Assessment (FRA)

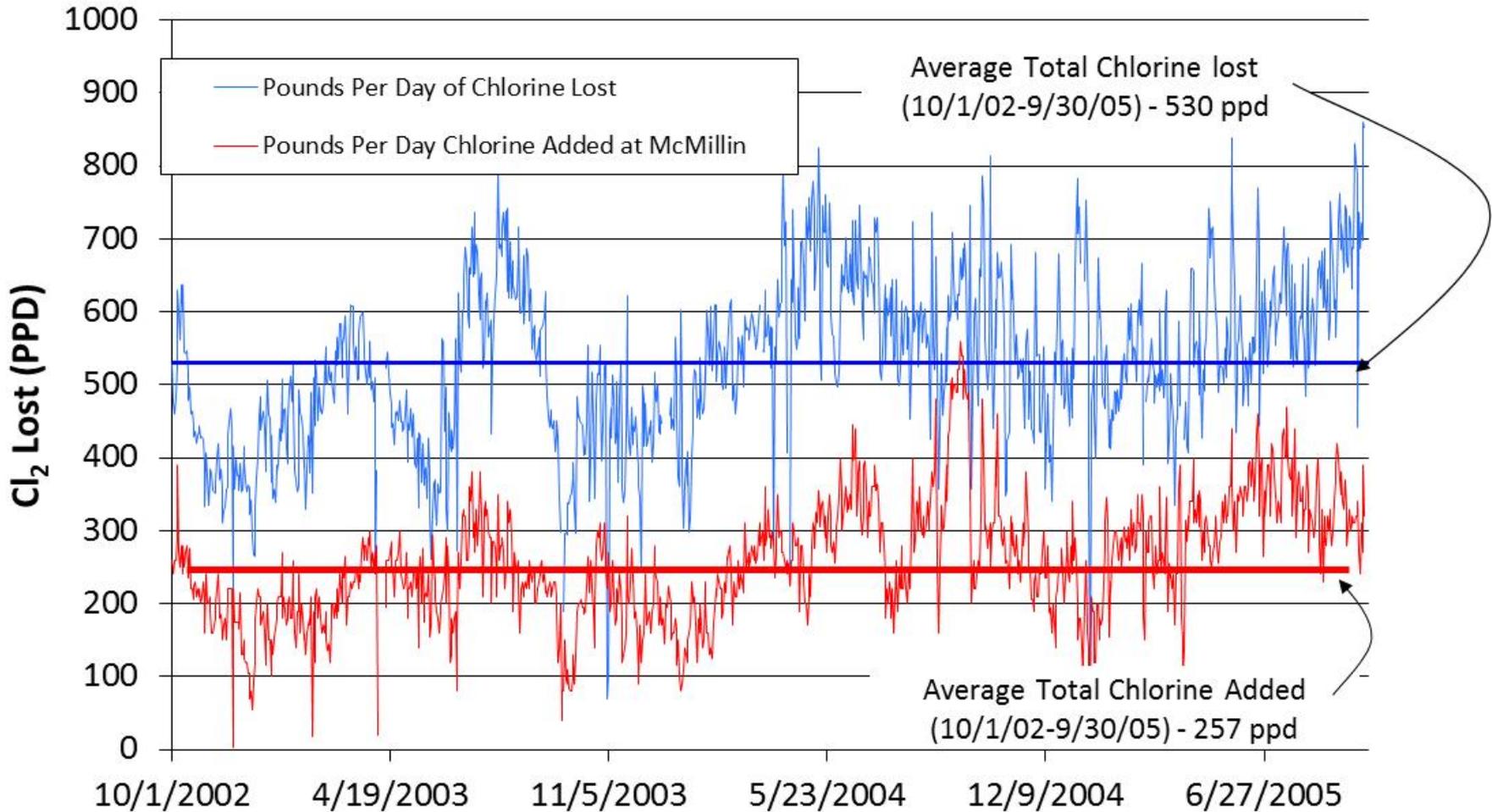
•Seattle Public Utilities T&O panel 1-9 SCALE

1. I would be very happy to accept this water as my everyday drinking water.
2. I would be happy to accept this water as my everyday drinking water.
3. I am sure that I could accept this water as my everyday drinking water.
4. I could accept this water as my everyday drinking water.
5. Maybe I could accept this water as my everyday drinking water.
6. I don't think I could accept this water as my everyday drinking water.
7. I could not accept this water as my everyday drinking water.
8. I could never drink this water.
9. I can't stand this water in my mouth, & I could never drink it.

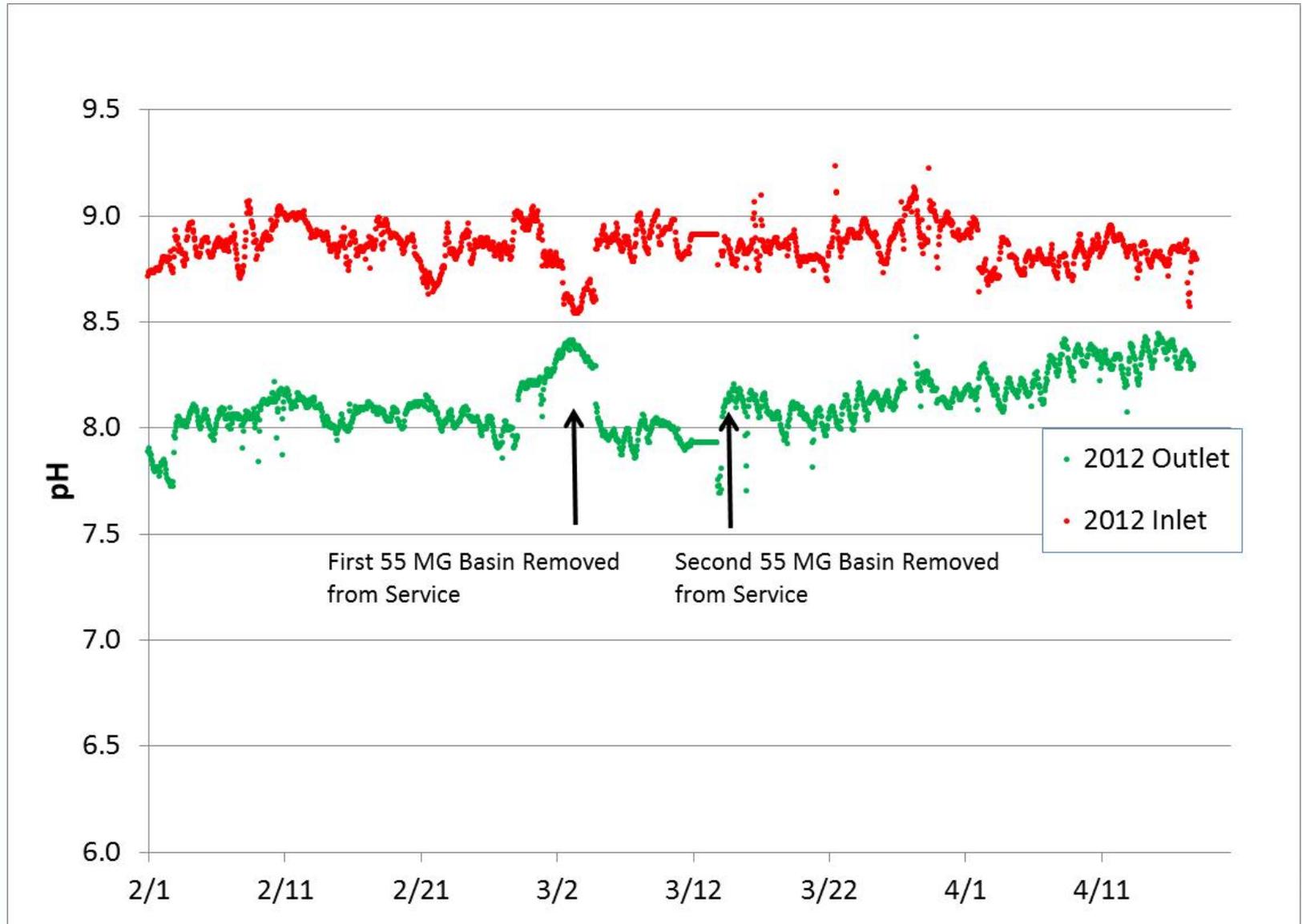
# PORTLAND AVE. RESERVOIR



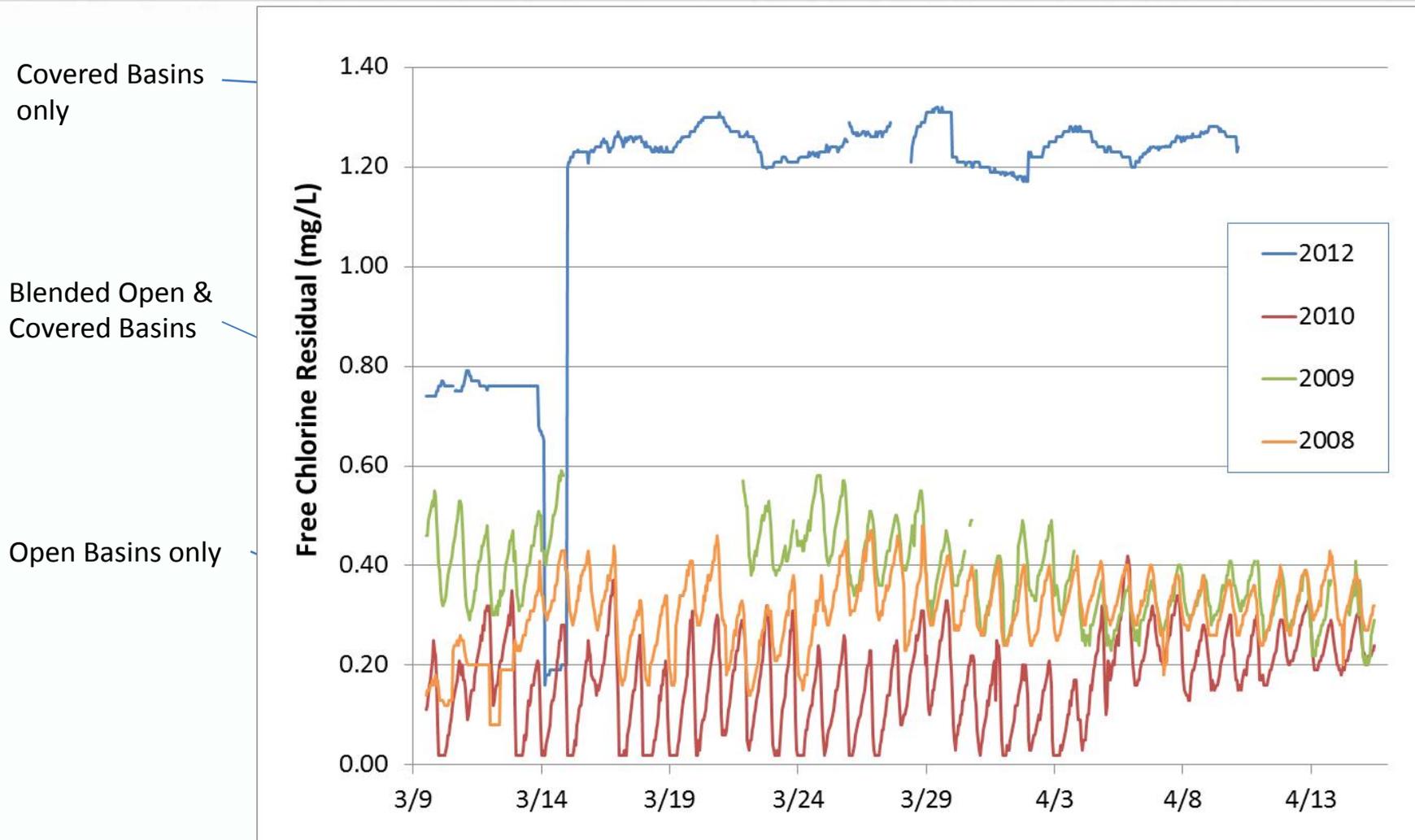
# POUND PER DAY OF CHLORINE LOST



# IMPACT OF REPLACEMENT ON pH



# WHAT CHANGE LOOKS LIKE



# IN SUMMARY

- The regulatory construct in Washington State has been moving utilities toward covering/replacing for almost 40 years.
- Tacoma's initial drive to cover/replace driven by persistent water quality challenges, and a sense of improving security.
- Elimination of midge fly larvae consumer complaints has been accomplished.
- Seasonal algae growth (and its associated impacts) have been eliminated.
- Real, immediate, unambiguous beneficial impacts to chemical disinfection processes have been realized at every reservoir site.
- Replacement strategies, coupled with improvements in intrusion detection have substantially mitigated security risk.