

MASSACHUSETTS WATER RESOURCES AUTHORITY
100 First Avenue, Charlestown Navy Yard, Boston, MA 02129



WATER QUALITY UPDATE
An Analysis of December 2009 Sampling Data

For more information, please contact MWRA at (617) 242-5323, or visit www.mwra.com.

December 2009 Highlights

- MWRA achieved CT disinfection requirements for the month** at the Ware Disinfection Facility and the Carroll Water Treatment Plant. CT results appear on Page 5. No community violated the Total Coliform Rule criteria. See Page 7.
- Carroll Water Treatment Plant is undergoing winter maintenance.** Train A was off-line from October 27 through December 7. Train B was removed from service on December 21 and will remain off-line for approximately six weeks.
- Did you know** that MWRA's web site has an archive of Monthly Water Quality Updates from 2001 onward at <http://www.mwra.com/monthly/wqupdate/qual3wq.htm>?

We are continually updating the report. Let us know what you think (617) 242-5323
Call (617) 242-5323 or email Joshua.Das@mwra.state.ma.us

Release Date: January 20, 2010

Water Quality Update

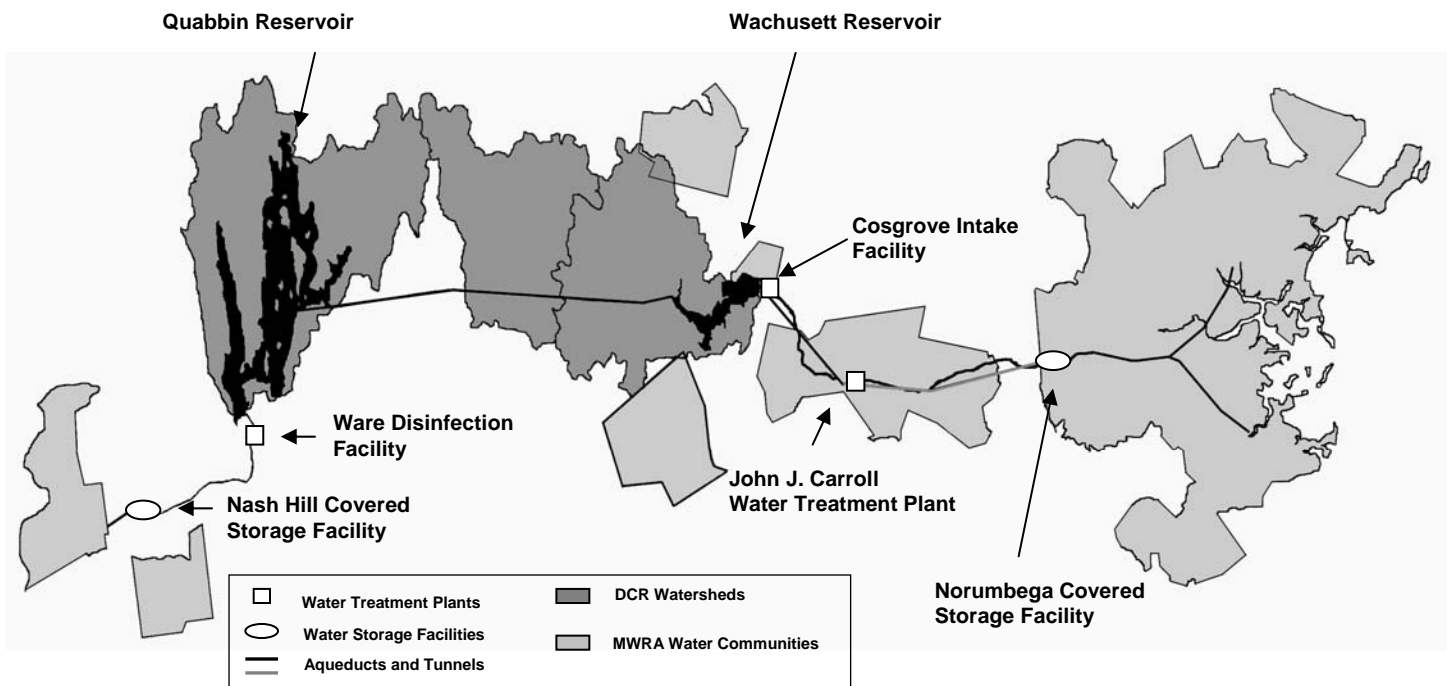
This is a monthly report containing information about the quality of water supplied by MWRA. It provides a more detailed review of water quality than the annual water quality report that is mailed each June to customers in our service area. The report is available at www.mwra.com.

The Water System

The MWRA supplies wholesale water to local water departments in 50 communities, 44 in greater Boston and MetroWest, three in Western Massachusetts, and as a back-up supply for three others. Each municipality is responsible for distributing the water within its own community. More than two million people are served by the MWRA water supply system.

Quabbin Reservoir is the primary source of water for our system and one of the country's largest water supply impoundments, with a capacity of 412 billion gallons. Quabbin water represents source water for the Chicopee Valley Aqueduct (CVA) system. Water is transferred from Quabbin Reservoir to the 65 billion gallon Wachusett Reservoir in Clinton via the Quabbin Aqueduct. Wachusett water represents source water for MetroWest and Metropolitan Boston communities. The watershed areas of the Quabbin and Wachusett Reservoirs total 401 square miles. The Department of Conservation and Recreation (DCR), which manages the watersheds, and MWRA are committed to protection of the water supply through aggressive watershed protection as the first line of defense against water contamination. Three-quarters of the watersheds are protected lands and over 80% are either forest or wetlands.

The map below indicates the location of reservoirs, treatment facilities, and service communities.



Indicators of Water Quality

Tests are conducted on water sampled at the source reservoirs (source or "raw water") and also on water after treatment ("treated water"). MWRA routinely uses six general indicators of water quality: microbial, corrosiveness, disinfection by-products, turbidity and algae, disinfectant residual, and mineral analysis. Testing frequencies vary by parameter.

The Federal Safe Drinking Water Act (SDWA) sets standards for source and treated water quality. The standards relate to coliform, turbidity, watershed protection, disinfection and disinfection by-products, over 120 potential chemical contaminants, and waterborne disease outbreaks. MWRA monitors for these parameters on schedules ranging from daily to annually.

Customer communities must also meet certain standards under the SDWA concerning distribution of treated drinking water. The Total Coliform Rule (TCR) helps to alert communities to possible microbial contamination as well as the adequacy of residual disinfection within the local distribution system. MWRA tests over 2000 samples per month. Under the SDWA, a violation of the TCR occurs when greater than 5% of the samples in a community are positive for total coliform during a month.

Source Water – Microbial Results

December 2009

Source Water - Microbial Results

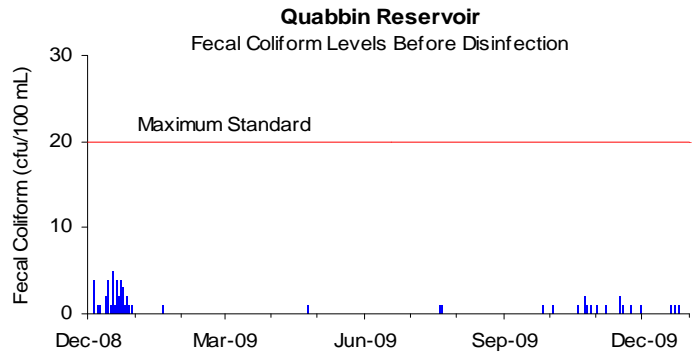
Total coliform bacteria are monitored in both source and treated water to provide an indication of overall bacteriological activity. Most coliforms are harmless. However, fecal coliform, a subclass of the coliform group, are identified by their growth at temperatures comparable to those in the intestinal tract of mammals. They act as indicators of possible fecal contamination. The Surface Water Treatment Rule for unfiltered water supplies allows for no more than 10% of source water samples prior to disinfection over any six-month period to have more than 20 fecal coliforms per 100ml.

Sample Site: Quabbin Reservoir

Quabbin Reservoir water is sampled at the Ware Disinfection Facility (WDF) raw water tap before entering the CVA system.

Three of the 31 samples were positive during December. None of the samples exceeded a count of 20 cfu/100ml.

For the current six-month period, 0.0% of the samples have exceeded a count of 20 cfu/100ml.



Sample Site: Wachusett Reservoir

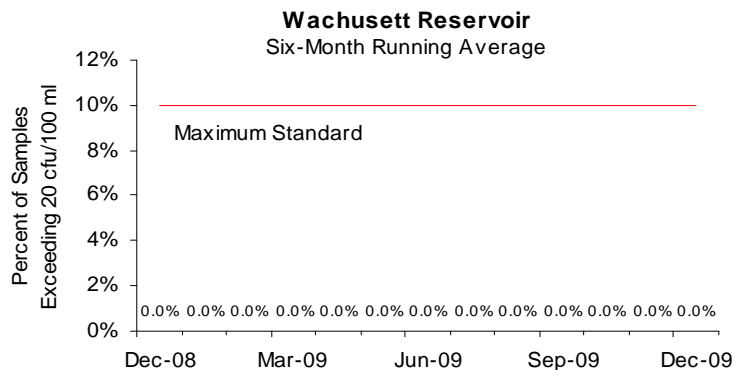
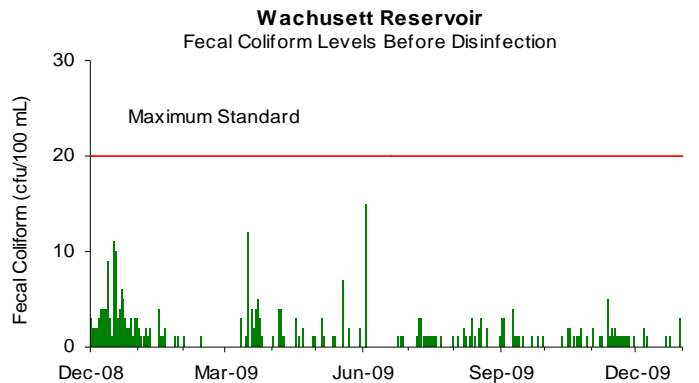
Wachusett Reservoir water is sampled at the CWTP raw water tap in Marlborough before it enters the MetroWest/Metropolitan Boston systems.

Fecal coliform levels tend to increase during the winter because, when water bodies near Wachusett ice over, waterfowl seek open water. Many roost at Wachusett, which tends to freeze later in the year than smaller ponds nearby.

DCR has an active bird harassment program to move the birds away from the intake area.

Five of the 31 samples were positive during December. None of the samples exceeded a count of 20 cfu/100ml.

For the current six-month period, 0.0% of the samples have exceeded a count of 20 cfu/100ml.



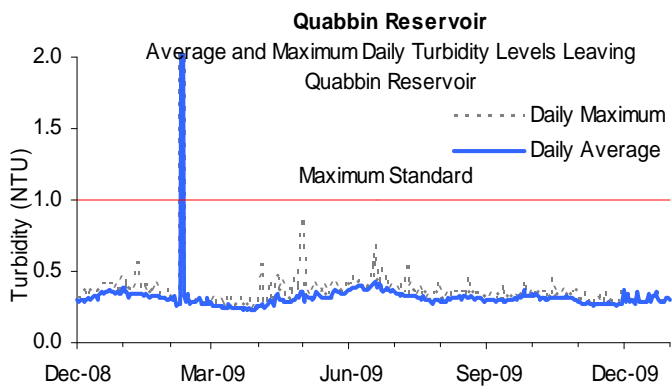
Source Water – Turbidity and Algae Results

December 2009

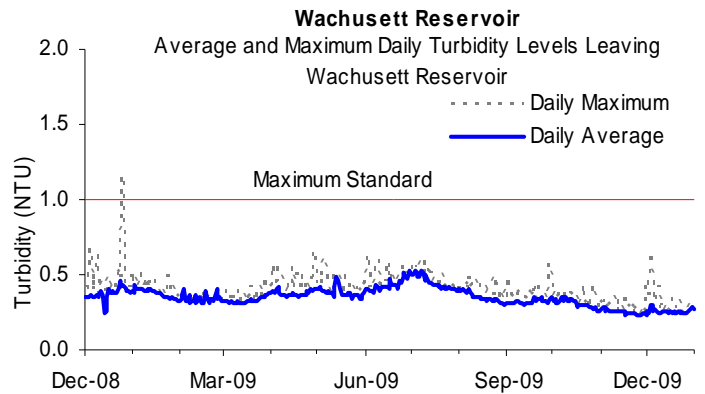
Source Water – Turbidity Results

Turbidity is a measure of suspended and colloidal particles including clay, silt, organic and inorganic matter, algae and microorganisms. The effects of turbidity depend on the nature of the matter that causes the turbidity. High levels of particulate matter may have a higher chlorine demand or may protect bacteria from the disinfectant effects of chlorine, thereby interfering with the disinfectant residual throughout the distribution system.

Turbidity of Quabbin Reservoir water is monitored continuously using on-line analyzers at the Ware Disinfection Facility before chlorination. Turbidity of Wachusett Reservoir is monitored continuously at the Carroll Water Treatment Plant before ozonation. The Massachusetts Department of Environmental Protection (DEP) standard for source water turbidity for unfiltered water supply systems is a maximum of 1.0 NTU; EPA's standard is a maximum of 5.0 NTU. Maximum turbidity results at Wachusett and Quabbin were within DEP standards for the month.



In February, there was a spike in turbidity at Quabbin when a planned valve operation disturbed sediment, but it did not disrupt disinfection effectiveness and was not a violation.

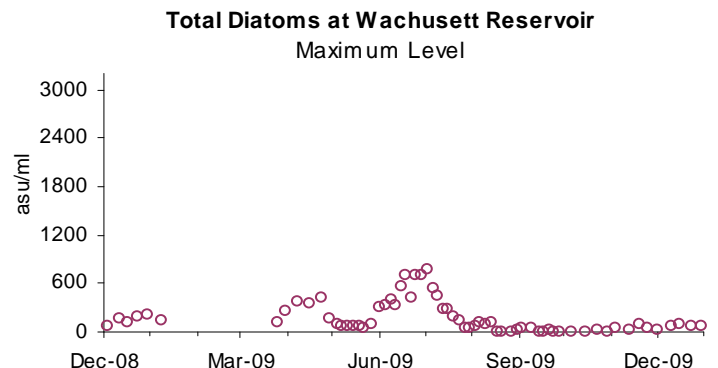
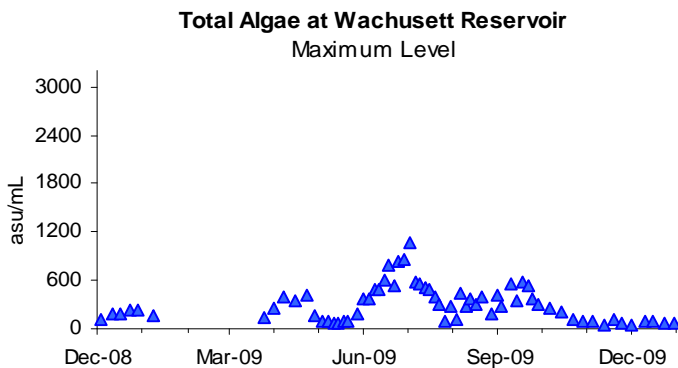


Source Water – Algae Levels

Algal levels in Wachusett Reservoir are monitored by DCR and MWRA. These results, along with taste and odor complaints, are used to make decisions on source water treatment for algae control.

Taste and odor complaints at the tap may be due to algae, which originate in source reservoirs, typically in trace amounts. Occasionally, a particular species grows rapidly, increasing its concentration in water. When *Synura*, *Anabaena*, or other nuisance algae bloom, MWRA may treat the reservoir with copper sulfate, an algacide. During the winter and spring, diatom numbers may increase. While not a taste and odor concern, consumers using filters may notice more frequent changing of the filters is needed.

No complaints were received during December from local water departments.



Treated Water – Disinfection Results

December 2009

Treated Water - Primary Disinfection

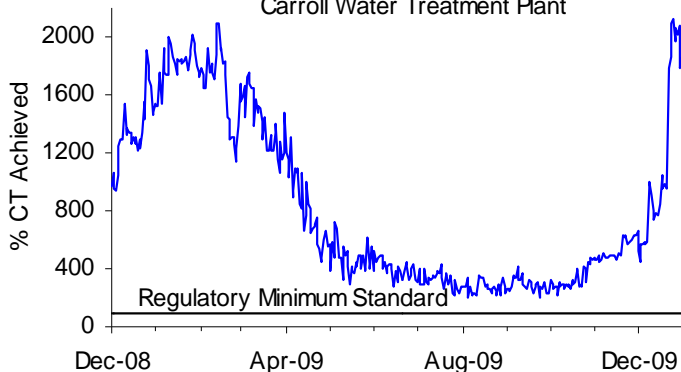
With the activation of the Carroll Water Treatment Plant (CWTP), MWRA now reports on both regulatory required 99.9% inactivation for *Giardia* (reported as “CT”), and its voluntary operating goal of 99% inactivation for *Cryptosporidium* (reported as “PR”). MWRA calculates hourly CT inactivation rates and reports daily CT inactivation rates at maximum flow, as specified by EPA regulations. The concentration (C) of the disinfectant over time (T) yields a measure of the effectiveness of disinfection. CT achievement for *Giardia* assures CT achievement for viruses, which have a lower CT requirement. The required CT for ozonated water varies with water temperature.

Compliance with the *Giardia* standard is expressed as percent of required CT achieved; 100% is the minimum allowed. To avoid confusion with the regulatory requirements, inactivation of *Cryptosporidium* is reported as Performance Ratio (PR). A PR of 1 demonstrates inactivation of 99% of *Cryptosporidium* based on site-specific data.

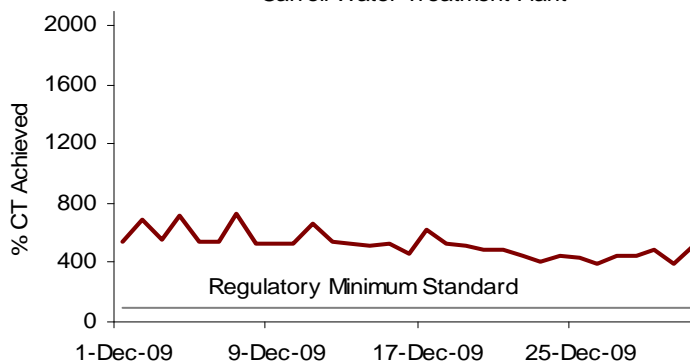
Wachusett Reservoir – MetroWest/MetroBoston Supply:

- CT was maintained above 100% at all times the plant was providing water into the distribution system for December; PR was maintained above 1.
- Ozone dose at the CWTP varied between 2.2 to 3.8 mg/L for December.

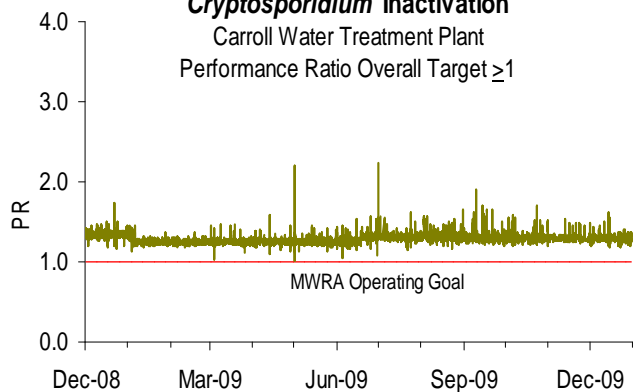
Giardia CT Percent Achievement
Carroll Water Treatment Plant



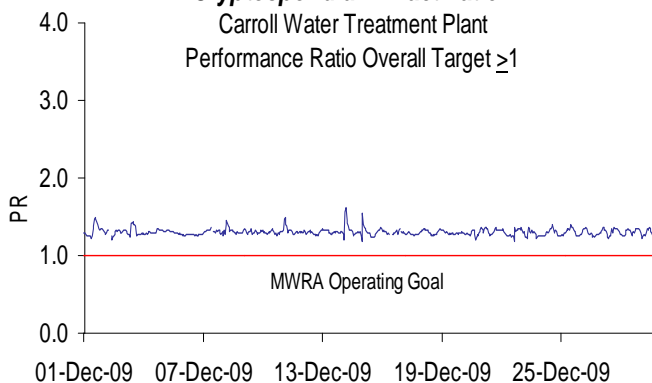
Giardia CT Percent Achievement
Carroll Water Treatment Plant



Cryptosporidium Inactivation
Carroll Water Treatment Plant
Performance Ratio Overall Target ≥ 1



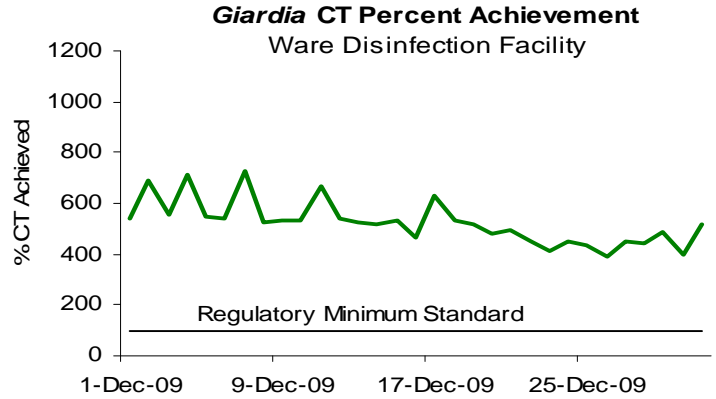
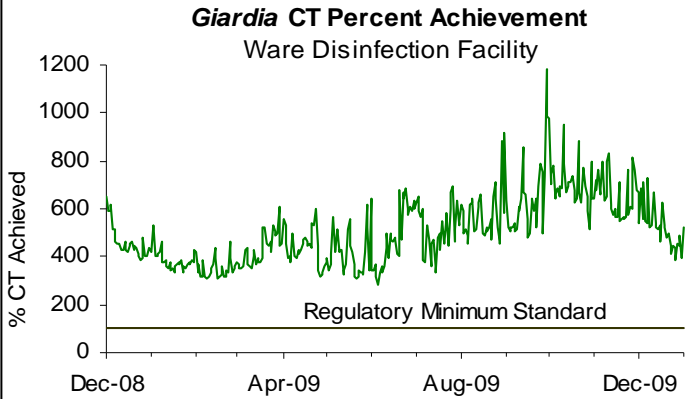
Cryptosporidium Inactivation
Carroll Water Treatment Plant
Performance Ratio Overall Target ≥ 1



Treated Water – Disinfection, pH and Alkalinity Results December 2009

Quabbin Reservoir at Ware Disinfection Facility (CVA Supply):

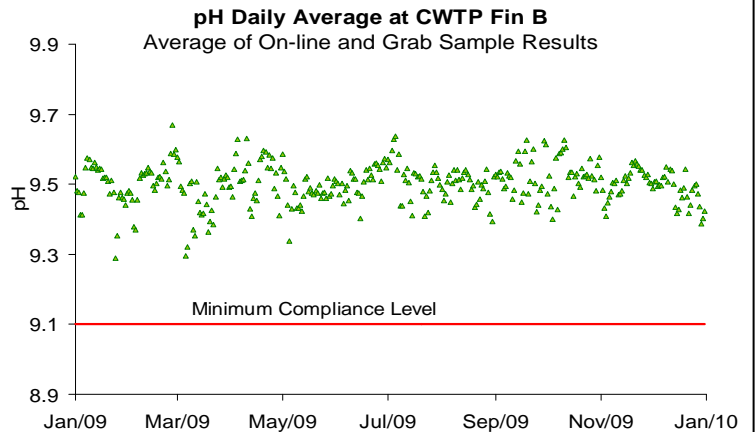
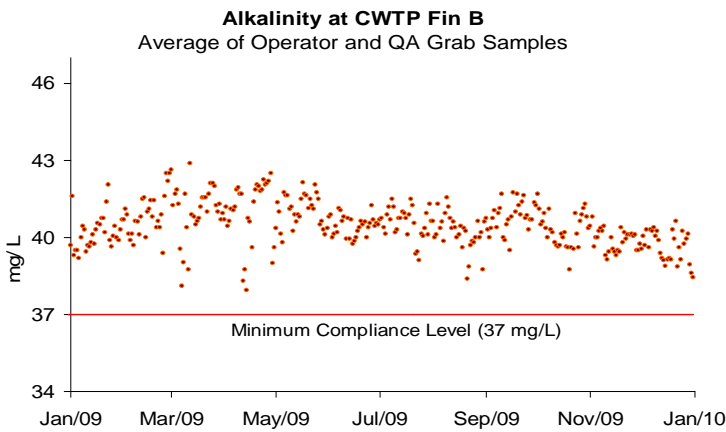
CT was maintained above 100% at all times the plant was providing water into the distribution system for December. Chlorine dose remained at 1.4 mg/L.



pH and Alkalinity Compliance:

MWRA adjusts the alkalinity and pH of Wachusett water to reduce its corrosivity which minimizes the leaching of lead and copper from service lines and home plumbing systems into the water. MWRA's target for distribution system pH is 9.3; the target for alkalinity is 40 mg/l. Per DEP requirements, samples from the CWTP Fin B tap have a minimum compliance level of 9.1 for pH and 37 mg/L for alkalinity. Samples from 27 distribution system taps have a minimum compliance level of 9.0 for pH and 37 mg/L for alkalinity. Results must not be below this level for more than 9 days in a six-month period. MWRA tests finished water pH and alkalinity daily at the CWTP Fin B sampling tap. Distribution system samples are collected in March, June, September, and December. Distribution system samples were collected on December 14, 2009. Distribution system sample pH ranged from 9.2 to 9.7 and alkalinity ranged from 39 to 44 mg/L.

In December and over the past six-months, no sample results were below the target levels.



Bacteria & Chlorine Residual Results for Communities in MWRA Testing Program December 2009

While all communities collect bacteria samples for the Total Coliform Rule (TCR), 40 systems (including Deer Island and Westboro State Hospital) use MWRA's Laboratory for TCR compliance testing. These systems collect samples for bacteriological analysis and measure water temperature and chlorine residual at the time of collection. The other 10 MWRA customer communities (including Lynn's GE plant) have their samples tested elsewhere and these towns should be contacted directly for their monthly results.

There are 137 sampling locations for which MWRA is required to report TCR results. These locations include a subset of the community TCR locations, as well as sites along MWRA's transmission system, water storage tanks and pumping stations.

The TCR requires that no more than 5% of all samples may be total coliform positive in a month (or that no more than one sample be positive when less than 40 samples are collected each month). Public notification is required if this standard is exceeded.

Escherichia coli (*E.coli*) is a specific coliform species that is almost always present in fecal material and whose presence likely indicates potential contamination of fecal origin. If *E.coli* are detected in a drinking water sample, this is considered evidence of a critical public health concern. Additional testing is conducted immediately and joint corrective action by DEP, MWRA, and the community is undertaken. Public notification is required if follow-up tests confirm the presence of *E.coli* or total coliform. A disinfectant residual is intended to maintain the sanitary integrity of the water; MWRA considers a residual of 0.2 mg/L a minimum target level at all points in the distribution system.

Highlights

One of the 1,998 community samples (0.05%) system-wide tested positive for confirmed total coliform during the month of December. None of the 697 MWRA samples (0.00%) tested positive for confirmed total coliform. No sample tested positive for *E.coli*. All 40 systems that submitted chlorine residual data maintained an average disinfectant residual of at least 0.2 mg/L. Only 4.1% of the samples had results lower than 0.2 mg/L.

TCR results by Community								
Town	Samples Tested for Coliform (a)	Total Coliform # (%) Positive	<i>E.coli</i> % Positive	Public Notification Required?	December 2009 Minimum Chlorine Residual (mg/L)	December 2008 Minimum Chlorine Residual (mg/L)	December 2009 Average Chlorine Residual (mg/L)	December 2008 Average Chlorine Residual (mg/L)
ARLINGTON	70	0 (0%)	0.0%		0.01	0.09	1.80	1.77
BELMONT	32	0 (0%)	0.0%		0.15	0.91	1.63	1.92
BOSTON	269	0 (0%)	0.0%		0.91	1.32	2.19	2.27
BROOKLINE	85	0 (0%)	0.0%		0.01	0.97	2.23	2.28
CHELSEA	40	0 (0%)	0.0%		1.36	1.58	2.04	2.20
DEER ISLAND	16	0 (0%)	0.0%		1.15	1.42	2.03	2.06
EVERETT	40	0 (0%)	0.0%		1.01	1.00	1.11	1.08
FRAMINGHAM	72	0 (0%)	0.0%		0.26	0.35	1.81	2.07
HANSCOM AFB (Bedford) (b)	9	0 (0%)	0.0%		0.03	0.04	1.20	1.25
LEXINGTON	45	0 (0%)	0.0%		0.17	1.08	2.09	2.14
LYNNFIELD	6	0 (0%)	0.0%		0.32	0.70	0.81	1.16
MALDEN	60	0 (0%)	0.0%		1.26	1.20	1.30	1.28
MARBLEHEAD	24	0 (0%)	0.0%		0.21	0.11	1.89	1.69
MARLBOROUGH (b)	52	0 (0%)	0.0%		0.47	0.02	1.68	2.08
MEDFORD	85	0 (0%)	0.0%		0.76	0.11	1.94	1.84
MELROSE	36	0 (0%)	0.0%		0.02	0.03	0.55	0.72
MILTON	32	0 (0%)	0.0%		1.13	1.07	1.73	1.66
NAHANT	10	0 (0%)	0.0%		0.09	0.09	1.37	1.51
NEEDHAM (b)	41	0 (0%)	0.0%		0.09	0.05	0.45	0.39
NEWTON	92	0 (0%)	0.0%		0.25	0.55	1.77	1.89
NORTHBOROUGH	16	0 (0%)	0.0%		0.04	0.02	1.40	1.69
NORWOOD	36	0 (0%)	0.0%		0.01	0.02	1.53	1.65
QUINCY	115	0 (0%)	0.0%		0.04	0.22	1.62	1.87
READING	50	0 (0%)	0.0%		0.08	0.71	1.70	1.96
REVERE	75	0 (0%)	0.0%		1.03	1.29	1.90	1.97
SAUGUS	40	0 (0%)	0.0%		1.72	1.70	1.99	2.01
SOMERVILLE	113	1 (0.88%)	0.0%	No	0.13	0.30	1.89	2.08
SOUTH HADLEY FD1 (c)	16	0 (0%)	0.0%		0.03	0.04	0.46	0.28
SOUTHBOROUGH	10	0 (0%)	0.0%		0.52	0.24	1.91	1.55
STONEHAM	35	0 (0%)	0.0%		0.94	1.50	1.93	2.28
SWAMPSCOTT	18	0 (0%)	0.0%		0.05	0.03	1.51	1.40
WAKEFIELD (b)	55	0 (0%)	0.0%		0.37	0.14	1.44	1.52
WALTHAM	72	0 (0%)	0.0%		0.02	0.22	2.05	2.13
WATERTOWN	50	0 (0%)	0.0%		0.21	0.19	1.79	1.85
WELLESLEY (b)	36	0 (0%)	0.0%		0.10	0.04	0.59	0.64
WESTBORO HOSPITAL	5	0 (0%)	0.0%		0.12	1.90	1.56	2.57
WESTON	16	0 (0%)	0.0%		0.53	0.28	1.85	1.69
WINCHESTER (b)	25	0 (0%)	0.0%		0.10	0.13	0.80	0.82
WINTHROP	24	0 (0%)	0.0%		0.17	0.37	1.45	1.64
WOBBURN (b)	75	0 (0%)	0.0%		0.06	0.04	0.64	0.87
Total:	1998	1 (0.05)%						
MASS. WATER RESOURCES AUTHORITY (d)	697	0 (0%)	0.0%		0.01	0.08	1.90	1.95

(a) The number of samples collected depends on the population served and the number of repeat samples required.

(b) These communities are partially supplied, and may mix their chlorinated supply with MWRA chloraminated supply.

(c) Part of the Chicopee Valley Aqueduct System. Free chlorine system.

(d) MWRA sampling program includes a subset of community TCR sites as well as sites along the transmission system, tanks and pumping stations. Some MWRA TCR sites which are entry points to the community had low chlorine residuals due to various reasons.

Treated Water - Disinfection By-Product (DBP) Levels in Communities

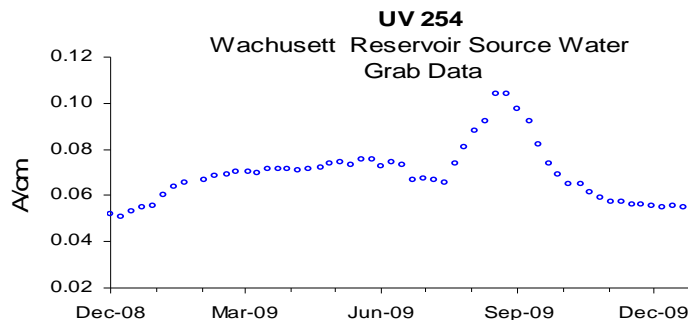
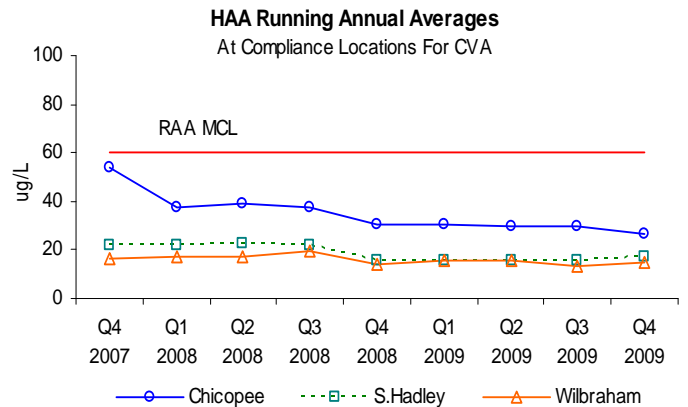
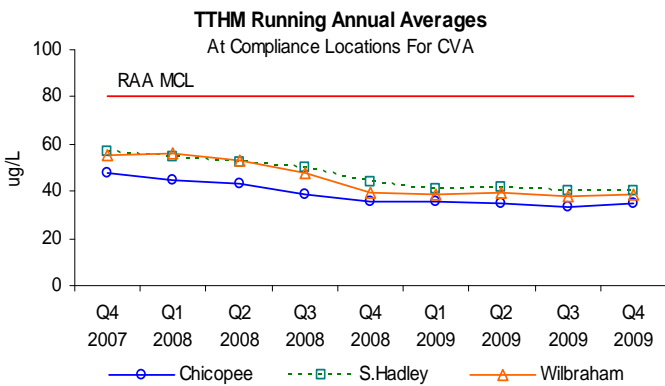
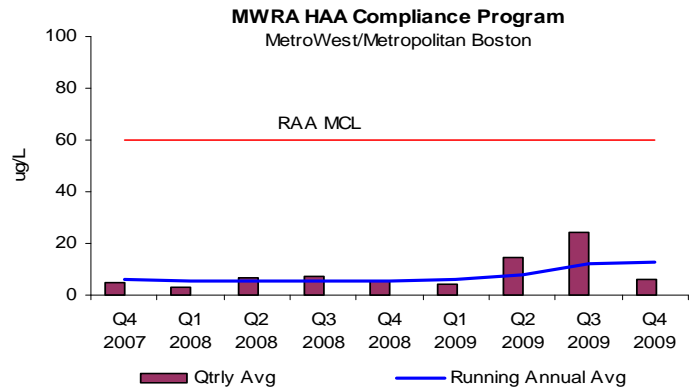
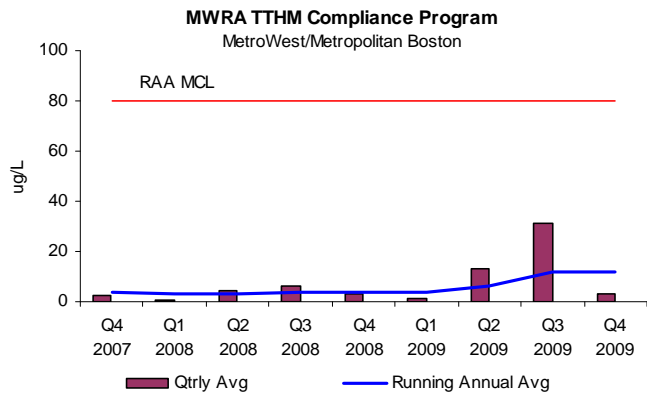
December 2009

Total Trihalomethanes (TTHMs) and Haloacetic Acids (HAA5s) are by-products of disinfection treatment with chlorine. TTHMs and HAA5s are of concern due to their potential adverse health effects at high levels. EPA's running annual average (RAA) standard is 80 ug/L for TTHMs and 60 ug/L for HAA5s. The switch from chlorine to ozone for primary disinfection and the consolidation of treatment has lowered DBP formation and results are now more uniform. DEP requires that compliance samples be collected quarterly. Partially served communities are responsible for their own compliance monitoring and reporting and must be contacted directly for their results.

Absorbance, measured as UV-254, is a surrogate measure of reactive organic matter. Regulated DBPs have dropped to very low levels with the CWTP coming on-line. However, UV-254 levels remain useful for estimating ozone dosage and serving as a trigger for Quabbin transfer consideration.

Bromate is tested monthly per DEP requirements for water systems that treat with ozone. Bromide in the raw water may be converted into bromate following ozonation. EPA's RAA Maximum Contaminant Level (MCL) standard for bromate is 10 ug/L.

The RAA for TTHMs and HAA5s for MWRA's Compliance Program (represented as the line in the top two graphs below) remain below current standards. The RAA for TTHMs = 12.2 ug/L; HAA5s = 12.4 ug/L. CVA's DBP levels continue to be below current standards. UV-254 levels are currently around 0.06 A/cm. The current RAA for Bromate = 0.0 ug/L.



MWRA Monthly Water Quality Analysis

December 2009

This page provides information on water quality at four locations in the MWRA transmission system. Results reflect a "snapshot" in time and may not represent typical conditions. Monitoring for parameters indicated in bold is quarterly as they either have minimal variability or are always below detection limits. The "Wachusett System" locations represent raw water from the Wachusett Reservoir (CWTP inlet) and finished water leaving the treatment plant (CWTP Finished water tap). The "CVA System" locations represent raw water from the Quabbin Reservoir (WDF) and finished water after all treatment (LMS).

Component	CVA System		Wachusett System Metro-Boston		Standard	Units	Method Detection Limit
	Quabbin Res. at Ware Disinfection Facility (Raw)	Ludlow Monitoring Station (Treated)	Carroll Water Treatment Plant Inlet (Raw)	Carroll Water TP Fin. Water Tap B (Treated)			
Alkalinity	2.8	3.6	6.4	40.0		MG/L	0.05
Aluminum	ND	ND	ND	ND	50-200 (c)	UG/L	15.0
Ammonia-N, Total	NS	0.01	0.01	0.56		MG/L	0.005
Antimony	ND	ND	ND	ND	6 (b)	UG/L	1.0
Arsenic	ND	ND	ND	ND	10 (b)	UG/L	1.0
Barium	7.2	7.6	9.3	9.4	2000 (b)	UG/L	2.0
Beryllium	ND	ND	ND	ND	4 (b)	UG/L	0.3
Bromate	ND	ND	ND	ND	10 (b)	UG/L	5.0
Bromide	10.5	6.3	17.9	19.7		UG/L	5.0
Cadmium ⁽¹⁾	ND	ND	ND	ND	5 (b)	UG/L	0.5
Calcium	1940	2010	4290	4290		UG/L	20
Chloride	6.1	7.4	20.8	23.3	250 (c)	MG/L	0.5
Chlorine, Free	NA	0.86	NA	0.08	4 (b)(d)	MG/L	0.02
Chlorine, Total	NA	NA	NA	2.7	4 (b)(d)	MG/L	0.02
Chromium	ND	ND	ND	ND	100 (b)	UG/L	1.0
Coliform, Fecal, MF Method	ND	NA	ND	NA	20 (a)	CFU/100 mL	1
Coliform, Total, MF Method ^(e)	ND	ND	20	ND	100 (a) 0 (b)	CFU/100 mL	1
Copper **	ND	3.9	ND	ND	1300 (f) 1000 (g)	UG/L	3.0
Cyanide	ND	ND	ND	ND	0.2 (b)	MG/L	0.01
Fluoride	0.05	0.05	0.05	1.00	4 (b)	MG/L	0.02
Hardness ⁽²⁾	6.9	7.1	14.0	14.0		MG/L	0.194
Iron **	10.0	10.3	30.3	24.8	300 (c)	UG/L	6.0
Lead	ND	ND	ND	ND	15 (f)	UG/L	1.2
Magnesium	499	501	853	850		UG/L	35
Manganese	4.4	3.5	13.1	7.7	50 (c)	UG/L	1
Mercury ⁽¹⁾	ND	ND	ND	ND	2 (b)	UG/L	0.01
Nickel	ND	ND	ND	ND		UG/L	5.0
Nitrate-N	ND	ND	0.077	0.082	10 (b)	MG/L	0.005
Nitrite	ND	ND	ND	ND	1 (b)	MG/L	0.005
Orthophosphate	0.003	0.003	0.005	0.008		MG/L	0.0025
pH	6.7	7.0	7.0	9.7		S.U.	
Potassium	445	451	935	912		UG/L	200
Selenium	ND	ND	ND	ND	50 (b)	UG/L	1.0
Silica (SiO ₂)	1570	1610	2940	3290		UG/L	200.0
Silver	ND	ND	ND	ND	100 (c)	UG/L	1.0
Sodium	5.2	6.4	12.6	29.1		MG/L	0.2
Specific Conductance	48	54	115	193		UMHO/cm	0.3
Standard Plate Count, HPC	NA	NA	16	1	500 (b)	CFU/mL	1
Sulfate (SO ₄)	4.7	4.7	6.5	7.2	250 (c)	MG/L	1.0
Thallium	ND	ND	ND	ND	2 (b)	UG/L	1.0
Total Dissolved Solids	NS	35.0	71.0	104.0	500 (c)	MG/L	13
Total Organic Carbon	1.7	1.8	2.2	2.0		MG/L	0.3
Total Phosphorus	ND	ND	0.02	0.01		MG/L	0.005
UV-254	0.025	0.019	0.059	0.040		A/cm	0.000965
Zinc **	4.2	6.3	ND	ND	5000 (c)	UG/L	1.5

(a) = Primary MCL standard (health related), applies to source (raw) water only. DEP "Drinking Water Regulations", 310CMR 22.00.

(b) = Primary MCL standard (health related). DEP "Drinking Water Regulations", 310CMR 22.00. Applies to samples of treated water downstream of Wachusett and Quabbin Reservoirs. Most based on annual average.

(c) = Secondary MCL standard (aesthetic related). DEP "Drinking Water Regulations", 310CMR 22.00.

(d) = Maximum Residual Disinfectant Level. DEP "Drinking Water Regulations", 310CMR 22.00. Based on annual average.

(e) = Confirmed results only are reported.

(f) = Refers to 90th percentile Action Level.

(g) = Refers to a single sample, secondary MCL.

MCL = Maximum Contaminant Level

CFU = Colony Forming Unit

S.U. = Standard Units

UG/L = micrograms per liter = parts per billion

MG/L = milligrams per liter = parts per million

NA = Not Applicable

NTU = Nephelometric Turbidity Unit

HPC = Heterotrophic Plate Count (48 Hrs @ 35 °C)

ND = Not Detected (below detection limit)

Bold Italics = Samples from December

Regular Font = Samples from October

Most results are based on single grab samples collected on December 1, 6 and 7, 2009 and analyzed by MWRA and contract laboratories.

NOTES:

(1) MWRA tests for cadmium and mercury are more sensitive than the EPA-set levels of detection and reporting. For cadmium any level below 1.0 ug/L and for mercury any level below 0.2 ug/L are under the EPA minimum detection limits. MWRA will continue to report any result below these detection limits here in the monthly report but will follow EPA reporting requirements

(2) MWRA water is considered soft. Water is measured by hardness - which is the amount of dissolved minerals in the water. MWRA water has a hardness of about 15-20 mg/l or about 1 grain/gallon (1 grain/gallon = 17.1 mg/L). For comparison, hard water would have greater than 75 mg/l hardness.