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

MWRA WATER QUALITY UPDATE

March 2014 Highlights

•**MWRA achieved CT disinfection requirements for the month** at the Ware Disinfection Facility and the Carroll Water Treatment Plant achieving at least 99.9% *Giardia* inactivation at all times. CT results appear on Page 3. No community violated the Total Coliform Rule criteria. See Page 4.

•**Carroll Water Treatment Plant is undergoing winter maintenance.** During this period, half the plant is removed from service. Train B was removed from service on January 15. Train B is expected to be back in service early April.

•**Due to the UV construction eliminating the ozone contactors, MWRA, with DEP approval, has lowered the voluntary *Cryptosporidium* target.** MWRA has met this target during construction. The minimum *Cryptosporidium* inactivation achieved by ozone for March was 67%. See Page 3.

•**UV treatment has been added at the Carroll Water Treatment Plant. UV is a highly effective disinfectant**. The UV system was operating in extended testing mode through the end of March and is achieving over 99% inactivation of *Cryptosporidium* for over 95% of the water. The UV facility officially went on-line for regulatory compliance on April 1. More information on the new facility is available on-line and in next month's report.

•**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.com*

Release Date: April 20, 2014

Source Water – Microbial and UV Results
March 2014

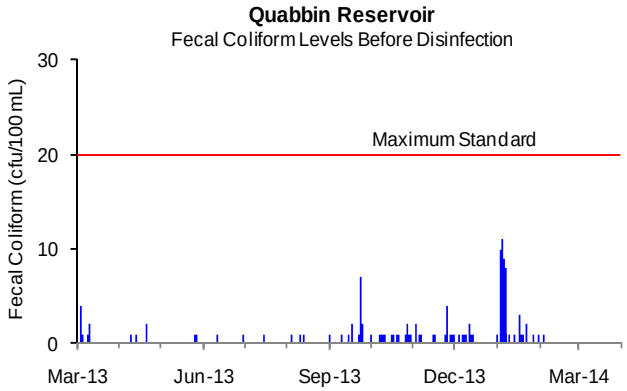
Source Water - Microbial Results

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 being treated and entering the CVA system.

None of the 31 samples were positive during March. **For the current six-month period, 0.0% of the samples have exceeded a count of 20 cfu/100mL.**

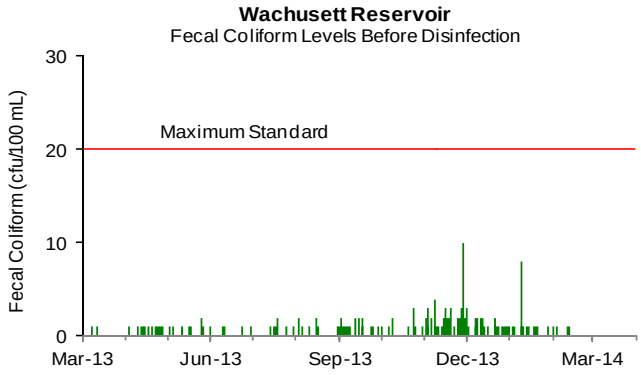


Sample Site: Wachusett Reservoir

Wachusett Reservoir water is sampled at the CWTP raw water tap in Marlborough before being treated and entering the MetroWest/Metropolitan Boston systems.

In the wintertime when smaller water bodies near Wachusett Reservoir freeze up, many waterfowl will roost in the main body of the reservoir - which freezes later. This increased bird activity tends to increase fecal coliform counts. DCR has an active bird harassment program to move the birds away from the intake area.

None of the 30 samples were positive during March. **For the current six-month period, 0.0% of the samples have exceeded a count of 20 cfu/100mL.**

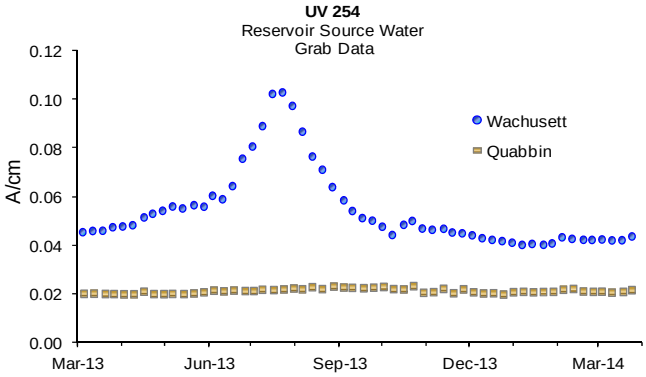


Source Water - UV Absorbance

UV Absorbance at 254nm wavelength (UV-254), is a measure of the amount and reactivity of natural organic material in source water. Higher UV-254 levels cause increased ozone and chlorine demand resulting in the need for higher ozone and chlorine doses, and can increase the level of disinfection by-products. UV-254 is impacted by tributary flows, water age, sunlight and other factors. Hurricanes can have a significant and long lasting impact.

Quabbin Reservoir UV-254 levels are currently around 0.021 A/cm.

Wachusett Reservoir UV-254 levels are currently around 0.042 A/cm.



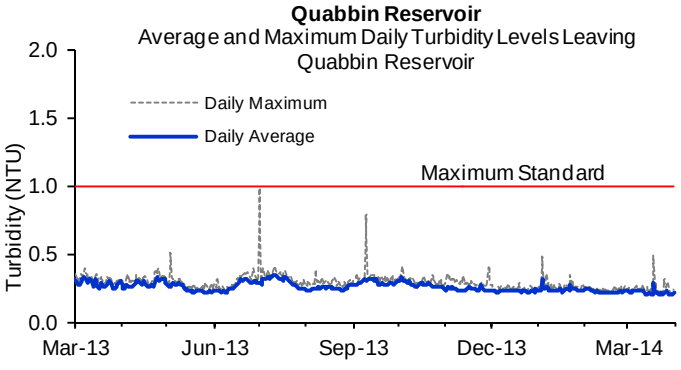
Turbidity and Disinfection Results
March 2014

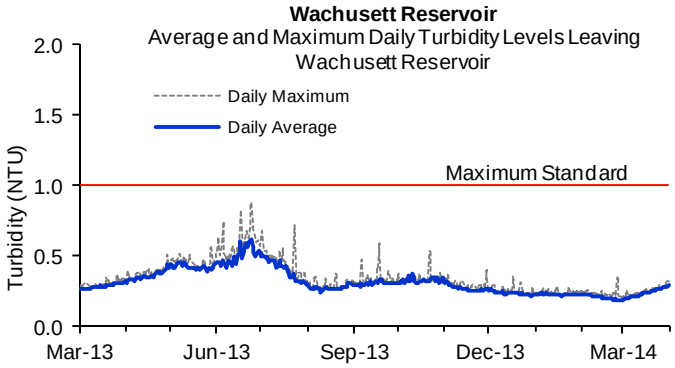
Source Water - Turbidity Results

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 disinfectant demand or may protect bacteria from disinfection effects, thereby interfering with the disinfectant residual throughout the distribution system.

There are two standards for turbidity: all water must be below 5 NTU (Nephelometric Turbidity Units), and water only can be above 1 NTU if it does not interfere with effective disinfection.

Turbidity of Quabbin Reservoir water is monitored continuously at the Ware Disinfection Facility (WDF) before chlorination. Turbidity of Wachusett Reservoir is monitored continuously at the Carroll Water Treatment Plant (CWTP) before ozonation. Maximum turbidity results at Quabbin and Wachusett were within standards for the month.



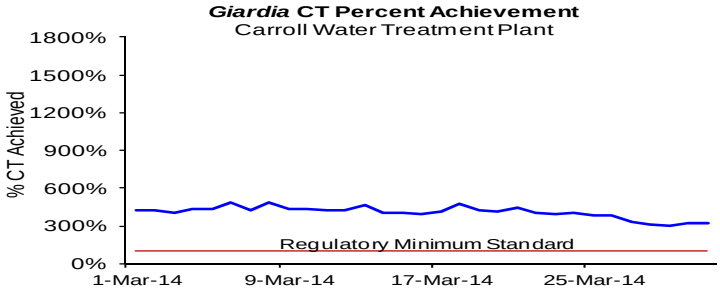


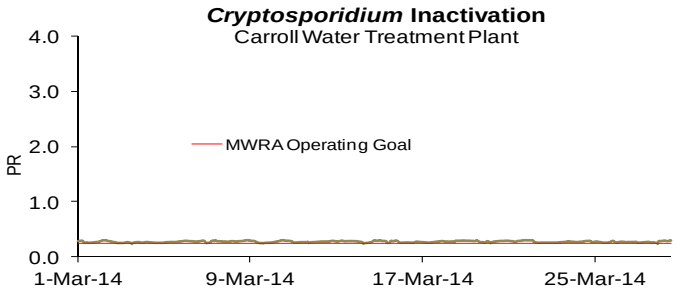
Treated Water - Primary Disinfection

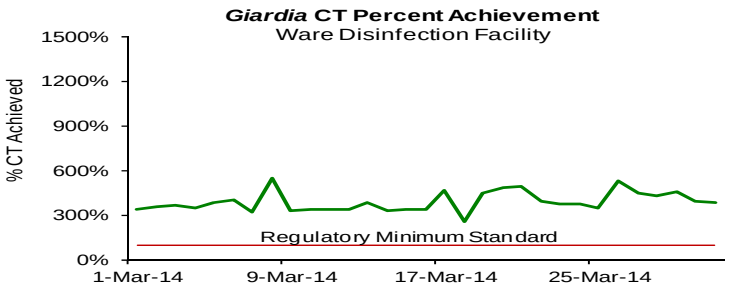
At the Carroll Water Treatment Plant (CWTP), MWRA reports on both regulatory required 99.9% inactivation for *Giardia* (reported as "CT"), and its voluntary operating goal of 99% inactivation for *Cryptosporidium* (reported as "PR"). MWRA reports daily CT inactivation rates at maximum flow, and meeting 100% of the required CT is the minimum allowed 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. 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:

- Ozone dose at the CWTP varied between 1.7 to 2.0 mg/L for March.
- *Giardia* CT was maintained above 100% at all times the plant was providing water into the distribution system for March.
- MWRA is not able to fully meet the voluntary *Cryptosporidium* inactivation target during the winter months due to the UV construction eliminating the extended ozone contactors. MWRA, with DEP approval, has lowered the voluntary *Cryptosporidium* target. The minimum *Cryptosporidium* inactivation achieved by ozone for March was 67%.
- The UV system was operating in extended testing mode through the end of March and is achieving over 99% inactivation of *Cryptosporidium* for over 95% of the water. The UV facility officially went on-line for regulatory compliance on April 1.







Quabbin Reservoir at Ware Disinfection Facility (CVA Supply):

Giardia CT was maintained above 100% at all times the plant was providing water into the distribution system for March. The chlorine dose at Ware Disinfection Facility (WDF) is adjusted in order to achieve MWRA's seasonal (November 1 – May 31) target of >0.75 mg/L at Ludlow Monitoring Station. The chlorine dose at WDF was1.4 mg/L for March.

Bacteria & Chlorine Residual Results for Communities in MWRA Testing Program
March 2014

While all communities collect bacteria samples for the Total Coliform Rule (TCR), 43 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.

There are 139 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 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. 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.

Highlight

None of the 1,989 community samples (0.0%) system-wide tested positive for total coliform during the month of March. None of the 627 MWRA samples (0.0%) tested positive for total coliform. No sample tested positive for *E.coli*. Only 1.7% of the samples had chlorine residuals lower than 0.2 mg/L.

		# Coliform Samples (a)	Total Coliform # (%) Positive	E.coli # Positive	Public Notification Required?	2014 Minimum Chlorine Residual (mg/L)	2013 Minimum Chlorine Residual (mg/L)	2014 Average Chlorine Residual (mg/L)	2013 Average Chlorine Residual (mg/L)
	MWRA Sampling Locations (d)	627	0 (0%)	0		0.07	0.05	1.94	1.84
Fully Served	ARLINGTON	52	0 (0%)	0		0.01	0.02	1.62	1.46
	BELMONT	40	0 (0%)	0		1.76	1.42	2.10	1.88
	BOSTON	257	0 (0%)	0		1.49	1.04	1.93	1.92
	BROOKLINE	68	0 (0%)	0		0.51	0.05	1.96	1.86
	CHELSEA	65	0 (0%)	0		1.20	1.20	1.95	1.88
	DEER ISLAND	20	0 (0%)	0		1.80	1.76	1.95	1.92
	EVERETT	65	0 (0%)	0		0.90	0.93	1.18	1.12
	FRAMINGHAM	72	0 (0%)	0		1.14	0.26	2.18	1.91
	LEXINGTON	36	0 (0%)	0		1.93	1.37	2.11	1.95
	LYNNFIELD	6	0 (0%)	0		0.98	0.65	1.53	1.24
	MALDEN	90	0 (0%)	0		1.62	0.21	1.75	1.62
	MARBLEHEAD	24	0 (0%)	0		0.25	0.21	1.72	1.68
	MEDFORD	68	0 (0%)	0		0.89	1.14	1.83	1.77
	MELROSE	45	0 (0%)	0		0.02	0.02	1.03	1.02
	MILTON	32	0 (0%)	0		1.38	1.21	1.78	1.72
	NAHANT	10	0 (0%)	0		0.81	0.09	1.57	1.40
	NEWTON	92	0 (0%)	0		1.08	0.64	2.01	1.76
	NORWOOD	33	0 (0%)	0		0.80	0.05	1.79	1.53
	QUINCY	92	0 (0%)	0		0.38	0.19	1.83	1.71
	READING	40	0 (0%)	0		0.74	0.26	1.68	1.55
	REVERE	61	0 (0%)	0		1.70	1.50	2.17	1.95
	SAUGUS	32	0 (0%)	0		1.41	1.46	1.89	1.79
	SOMERVILLE	104	0 (0%)	0		1.09	1.13	1.93	1.81
	SOUTHBOROUGH	10	0 (0%)	0		0.93	0.35	2.05	1.91
	STONEHAM	28	0 (0%)	0		1.60	1.16	1.93	1.83
	SWAMPSCOTT	18	0 (0%)	0		1.66	0.67	1.90	1.53
	WALTHAM	72	0 (0%)	0		1.71	0.32	2.15	1.69
	WATERTOWN	40	0 (0%)	0		1.40	1.03	2.05	1.77
	WESTBORO HOSPITAL	5	0 (0%)	0		0.08	0.02	0.36	0.03
	WESTON	16	0 (0%)	0		1.80	1.74	2.19	1.95
	WINTHROP	24	0 (0%)	0		0.29	0.06	1.80	1.13
	Total: Fully Served	*1617*	*0 (0%)*						
CVA & Partially Served	BEDFORD	20	0 (0%)	0		0.19	0.11	1.04	0.87
	CANTON	29	0 (0%)	0		0.03	-	1.02	-
	HANSCOM AFB	9	0 (0%)	0		1.10	0.49	1.66	1.48
	MARLBORO	42	0 (0%)	0		1.34	1.15	2.33	2.01
	NEEDHAM	41	0 (0%)	0		0.07	0.11	0.47	0.84
b	NORTHBORO	16	0 (0%)	0		1.17	0.58	1.89	1.60
	WAKEFIELD	44	0 (0%)	0		0.45	0.41	1.43	1.30
	WELLESLEY	38	0 (0%)	0		0.03	0.03	0.61	0.64
	WILMINGTON	29	0 (0%)	0		1.55	1.52	2.02	1.93
	WINCHESTER	28	0 (0%)	0		0.23	0.17	1.12	0.79
	WOBURN	60	0 (0%)	0		0.13	0.02	0.91	0.82
c	SOUTH HADLEY FD1	16	0 (0%)	0		0.21	0.17	0.50	0.53
	Total: CVA & Partially Served	*372*	*0 (0%)*						
	Total: Community Samples	*1989*	*0 (0%)*						

(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.

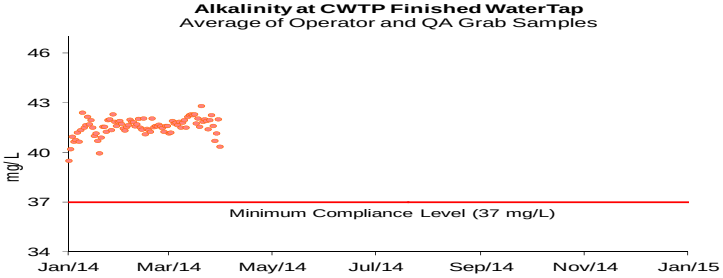
(d) MWRA total coliform and chlorine residual results include data from 125 community pipe locations as described above. In most cases these community results are accurately indicative of MWRA water as it enters the community system; however, some are clearly strongly influenced by local pipe conditions. Residuals in the MWRA system are typically between 1.0 and 2.8 mg/L.

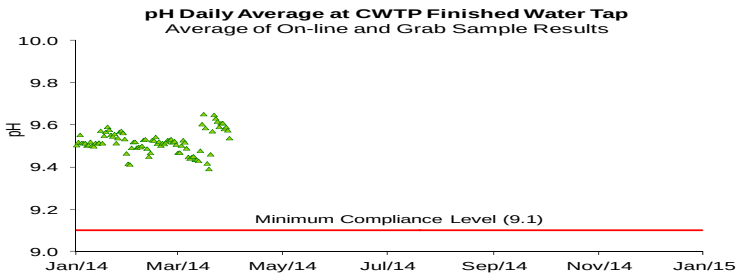
Treated Water - pH and Alkalinity and Disinfection By-Product (DBP) Levels in Communities
March 2014

Treated Water - 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. When CWTP undergoes winter maintenance, samples are collected at the CWTP Fin A sampling tap. Distribution system samples are collected in March, June, September, and December. Distribution system samples were collected on March 12 and 13, 2014. Distribution system sample pH ranged from 9.4 to 9.7 and alkalinity ranged from 42 to 43 mg/L.

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





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

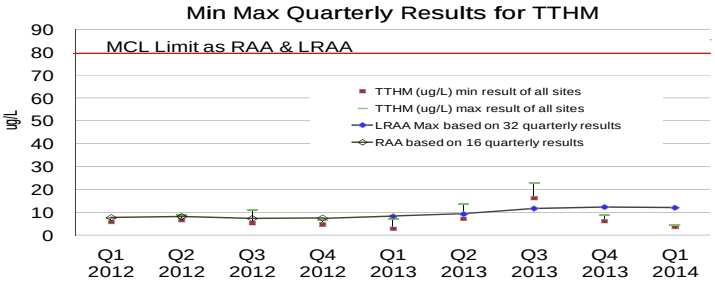
Total Trihalomethanes (TTHMs) and Haloacetic Acids (HAA5s) are by-products of disinfection treatment with chlorine. TTHMs and HAA5s are of concern due to their potential adverse health effects at high levels. EPA's running annual average (RAA) standard is 80 µg/L for TTHMs and 60 µg/L for HAA5s. For the MetroBoston system, effective Q2 2013, under the Stage 2 DBP Rule, compliance is based on locational running annual averages (LRAA). Sampling locations have increased from 16 to 32 each quarter. Data prior to Q1 2013 reports the running annual average, and since Q1 2013, the maximum LRAA is reported (in addition to min and max values). For the CVA communities, effective Q3 2013, under the Stage 2 DBP Rule, compliance is based on a LRAA for each community. Sampling locations have increased from 12 to 14 each quarter. Prior to Q3 2013, the running annual average is reported, and since Q3 2013, the maximum LRAA is reported (in addition to min and max values). The chart below combines all three CVA communities data.

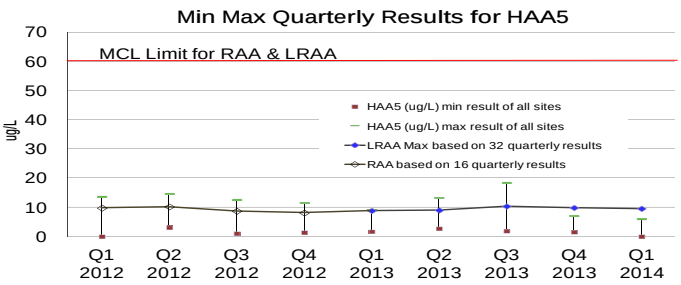
Partially served and CVA communities are responsible for their own compliance monitoring and reporting, and must be contacted directly for their individual results.

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 µg/L.

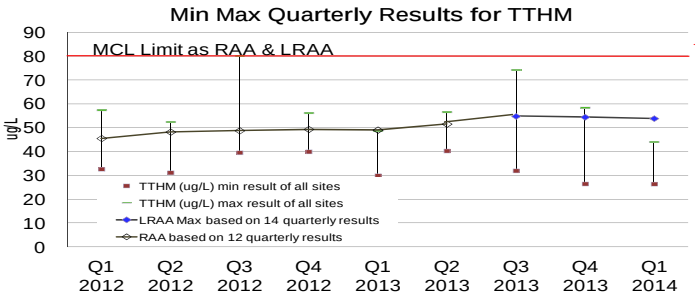
The LRAA for TTHMs and HAA5s for MWRA's Compliance Program (represented as the line in the top two graphs below) remain below current standards. The Max LRAA in the first quarter for TTHMs = 12.2 µg/L; HAA5s = 9.5 µg/L. The current RAA for Bromate = 0.0 µg/L. CVA's DBP levels continue to be below current standards.

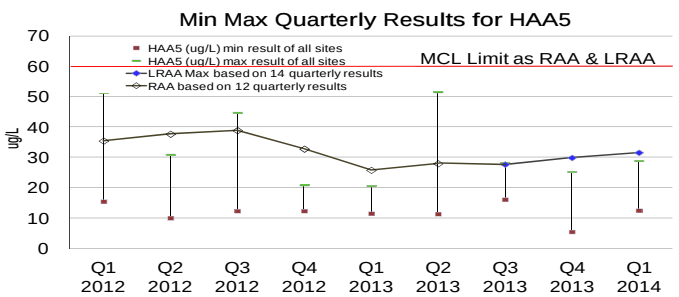
MetroBoston Disinfection By-Products





CVA Disinfection By-Products





MWRA Monthly Water Quality Analysis
March 2014

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). See www.mwra.com for additional information on other parameters which are monitored less frequently.

	CVA System		Wachusett System Metro-Boston		Standards →			
Component	**Quabbin Res. at Ware Disinfection Facility (Raw)**	**Ludlow Monitoring Station (Treated)**	**Carroll Water Treatment Plant Inlet (Raw)**	**Carroll Water TP Fin. Water Tap (Treated)**	**Health Standard**	**Aesthetics or Other Standards**	**Units**	**Method Reporting Limit**
Alkalinity	***3.3***	***4.0***	***6.2***	***41.4***			MG/L	0.05
Aluminum	U	U	U	U		50-200 (c)	UG/L	15.0
Ammonia-N, Total	U	U	0.01	0.37			MG/L	0.005
Antimony	U	U	U	U	6 (b)		UG/L	0.4
Arsenic	U	U	U	U	10 (b)		UG/L	1.0
Barium	6.0	5.8	7.4	7.4	2000 (b)		UG/L	2.0
Beryllium	U	U	U	U	4 (b)		UG/L	0.3
Bromate	***U***	***U***	***U***	***U***	10 (b)		UG/L	5.0
Bromide	***10.0***	***6.1***	***13.3***	***12.1***			UG/L	5.0
Cadmium [1]	U	U	U	U	5 (b)		UG/L	0.5
Calcium	2010	2080	3900	3960			UG/L	50
Chloride	7.4	8.8	18.4	20.9		250 (c)	MG/L	0.5
Chlorine, Free		***0.86***			4 (b)(d)		MG/L	0.02
Chlorine, Total				***2.34***	4 (b)(d)		MG/L	0.02
Chromium, Total	U	U	U	U	100 (b)		UG/L	1.0
Coliform, Fecal, MF Method	***U***		***U***		20 (a)		CFU/100 mL	1
Coliform, Total, Colilert Method	***2***	***U***	***U***	***U***	100 (a) 0 (b)		MPN/100 mL	1
Copper **	U	U	U	U		1300 (e) 1000 (f)	UG/L	3.0
Cyanide	U	U	U	U	0.2 (b)		MG/L	0.01
Fluoride [3]	0.05	0.05	0.05	***1.00***	4 (b)		MG/L	0.02
Hardness [2]	7.4	7.5	13.4	13.3			MG/L	0.194
Iron **	10.6	8.8	11.2	12.4		300 (c)	UG/L	6.0
Lead	0.06	0.11	U	U		15 (e)	UG/L	0.05
Magnesium	573	554	881	838			UG/L	35
Manganese	4.00	2.85	4.04	4.40		50 (c) 300 (g)	UG/L	0.1
Mercury [1]	U	U	U	U	2 (b)		UG/L	0.05
Nickel	U	U	U	U			UG/L	0.5
Nitrate-N	0.015	0.011	0.053	0.057	10 (b)		MG/L	0.005
Nitrite	U	U	U	0.006	1 (b)		MG/L	0.005
Orthophosphate	0.003	U	0.005	0.007			MG/L	0.0025
pH	***6.8***	***7.1***	***7.0***	***9.6***			S.U.	
Potassium	511	518	829	897			UG/L	200
Selenium	U	U	U	U	50 (b)		UG/L	1.0
Silica (SiO2)	1750	1730	2190	2710			UG/L	200.0
Silver	U	U	U	U		100 (c)	UG/L	1.0
Sodium	5.2	6.2	12.1	34.8			MG/L	0.2
Specific Conductance	***47***	***62***	***103***	***185***			UMHO/cm	0.3
Standard Plate Count, HPC	***U***		***10***	***U***	500 (b)		CFU/mL	1
Sulfate (SO4)	4.2	4.3	5.7	8.2		250 (c)	MG/L	1.0
Thallium	U	U	U	U	2 (b)		UG/L	0.3
Total Dissolved Solids	45.0	37.0	59.0	97.0		500 (c)	MG/L	13
Total Organic Carbon	2.0	2.0	***2.3***	2.3			MG/L	0.3
Total Phosphorus	U	U	U	U			MG/L	0.05
UV-254	***0.021***	0.015	***0.042***	***0.032***			A/cm	0.000965
Zinc **	1.7	2.1	U	U		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. Fecal standard takes precedence when both fecal and total coliform are tested.

(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) = Refers to 90th percentile Action Level.

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

(g) =DEP Advisory Level, reference *www.mass.gov/eea/docs/dep/water/drinking/alpha/i-thru-z/mangfactsheet.pdf*

U = Less than method reporting limit
MCL = Maximum Contaminant Level
= Not Applicable
CFU = Colony Forming Unit
S.U. = Standard Units

UG/L = micrograms per liter = parts per billion
MG/L = milligrams per liter = parts per million
NTU = Nephelometric Turbidity Unit
HPC = Heterotrophic Plate Count (48 Hrs @ 35 °C)

** = Metal results may be elevated due to local plumbing at the sample tap.
MPN = Most Probable Number
Bold Italics = Samples from March
Regular Font = Quarterly results from January samples

This month's results are based on single grab samples collected on March 3 and 4, 2014 and analyzed by MWRA and contract laboratories.

NOTES:

(1) Due to MWRA lab equipment having higher sensitivity, MWRA's tests for several parameters are more sensitive than the EPA-set levels of detection and reporting. For example, the EPA minimum detection limit for cadmium is 1 ug/L and 0.2 ug/L for mercury, and MWRA lab tests and reports at lower than these detection limits.

(2) MWRA water is considered soft. Water hardness is characterized by the amount of dissolved minerals in the water, in particular calcium and magnesium. 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.

(3) Fluoride dose is 1.0 mg/L with a desired range of 0.8 to 1.2 mg/L.