Massachusetts Water Resources Authority

OCTOBER 20 1998

WATER QUALITY UPDATE

An Analysis of September, 1998 Sampling Data.

In this Issue. . .

September, 1998 Sampling Data pp. A-E
Special Supplement: Community Average Total Chlorine Residuals & MWRA Monthly Mineral Analysis

This is a periodic report containing important information about the quality of water supplied by MWRA. We hope this report is useful to you as a local water supplier, public health official, water consumer or observer of MWRA's system performance.

MWRA provides about 250 million gallons of water each day to 46 cities and towns in eastern and central Massachusetts. Each municipality is responsible for distributing the water in its own community. Twenty-five of the customer communities are fully supplied by MWRA. The other communities use MWRA water to augment their own supplies, either on a regular basis or in times of water shortage. More than two million people are served by the MWRA water supply system.

THE WATER 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. Water is transferred from the Quabbin Reservoir to the 65 billion gallon Wachusett Reservoir in Clinton via the Quabbin Aqueduct. The watersheds serving the Quabbin and Wachusett Reservoirs total 294 square miles. MWRA and the Metropolitan District Commission (MDC) are committed to protection of the water supply through aggressive watershed management as the first line of defense against water contamination.

Water is next piped from the Wachusett Reservoir to Norumbega and Weston Reservoirs in Weston via the Hultman and Weston Aqueducts respectively. Municipalities in the MWRA service area receive drinking water distributed directly from the Hultman Aqueduct, the Norumbega Reservoir and the Weston Reservoir.

INDICATORS OF WATER QUALITY

MWRA routinely uses six general indicators of water quality:

- Microbial (bacteria and algae)
- Turbidity
- Corrosiveness (pH and alkalinity)
- Disinfectant
- Chemical (inorganic and organic)
- Radionuclides

Tests are conducted on water sampled at the source reservoirs (source water) and also on water after treatment sampled from MWRA or community lines (treated water). Testing frequencies vary by parameter.

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

Total coliform bacteria are monitored in both source and treated water to provide an indication of overall bacteriological activity. Since many members of the coliform bacteria group originate from the non-intestinal environment, such as soil, many coliform are harmless. A subclass of the coliform group which are identified by their growth at temperatures consistent with intestinal environments, the "fecal coliform bacteria," are indicators of possible intestinal contamination. *Escherichia coli (E. coli)* is a specific coliform species that is almost always present in fecal material and whose presence indicates likely bacterial contamination of intestinal origin.

For more information, please contact **MWRA Public Affairs at (617) 242-6000**
100 First Avenue, Charlestown Navy Yard, Boston, MA 02129.
For further information regarding health concerns, please contact the **Department of Public Health/Division of Epidemiology at (617) 983-6800** or **Boston Health and Hospitals at (617) 534-5611.**

Turbidity: 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 which causes the turbidity. Particulate matter may have a chlorine demand or may protect bacteria from the disinfectant effects of chlorine, thereby interfering with the maintenance of a disinfectant residual throughout the distribution system.

Corrosiveness: In order to minimize the leaching of lead and copper in plumbing systems, the pH, or corrosivity, is monitored and adjusted. Water provided by MWRA is basically lead free when it leaves the reservoirs but individual building service lines that carry water from street mains, as well as household plumbing fixtures, can contain lead that is susceptible to corrosion and leaching into tap water. In June 1996, MWRA's Interim Corrosion Control (ICC) facility in Marlborough went on-line. MWRA believes the ICC provides the optimal corrosion control treatment now achievable for all MWRA customer communities east of and including Marlborough. The chemicals sodium carbonate (soda ash) and CO_2 (carbon dioxide) are added to increase the pH and buffering capacity of the water which should considerably reduce the lead levels found when you first use your tap.

Disinfectant: MWRA treats the water supplied using disinfection facilities at Quabbin, Wachusett, Norumbega and Weston Reservoirs. At Wachusett Reservoir, chlorine is added to provide primary disinfection necessary to inactivate pathogens that may be present in the source water. At Norumbega and Weston Reservoirs, chlorine also provides some additional primary disinfection. With the further addition of ammonia, chloramines are formed to establish a sufficient level of residual disinfectant to protect against any new contaminants that may enter the distribution system.

Chemical: Inorganics are measured at Quabbin and Wachusett Reservoirs. Analyses of disinfection byproducts such as trihalomethanes are performed at various locations throughout the distribution system. Volatile organic compounds are measured at the distribution reservoirs: Norumbega and Weston. Synthetic organic compounds are measured at Wachusett Reservoir. MWRA generally meets applicable standards.

Radionuclides: Radionuclides are measured at three distribution locations. MWRA generally meets applicable standards.

SAMPLING AND ANALYSIS

MWRA conducts all water sampling and testing required by federal and state law. We also conduct baseline and periodic research to help us improve water quality. Results of testing are compared to standards and guidelines prepared by DEP and recommendations for further action are made if reported levels are above the standards.

Source water: MWRA collects samples from the source water supply and reservoirs which are tested for coliform bacteria, turbidity, pH, chemical constituents and radionuclides.

Treated water: MWRA collects treated water samples throughout the system and conducts tests for pH, temperature, disinfectant residual and coliform bacteria. In addition, customer communities routinely collect treated water samples in compliance with federal Safe Drinking Water Act (SDWA) testing requirements including the Total Coliform Rule. These samples are analyzed for disinfectant residual and coliform bacteria.

Communities may bring their samples to the MWRA Water Quality Laboratory for analysis, or they may have samples analyzed elsewhere. MWRA Laboratories test samples for all customer communities except Bedford, Cambridge, Canton, Chicopee, Clinton, Leominster, Lynn, Marlborough, Northborough, Peabody, South Hadley, Wilbraham, Woburn and Worcester. Community data for these communities are not presented in this report.

FEDERAL SAFE DRINKING WATER ACT (SDWA)

The Surface Water Treatment Rule (SWTR) of the SDWA sets standards for unfiltered use of MWRA's source waters from the Quabbin and Wachusett Reservoirs. If such standards are not met, filtration could be required. The standards relate to coliform, turbidity, watershed protection, disinfection byproducts and the absence of waterborne disease outbreaks. Quabbin Reservoir has demonstrated compliance with the standards and has therefore been found to be exempt from the filtration requirement. A decision about filtration of Wachusett source water has been deferred until 1998 as part of the consideration of treatment process technology at the new MWRA treatment plant to be constructed at Walnut Hill.

MWRA

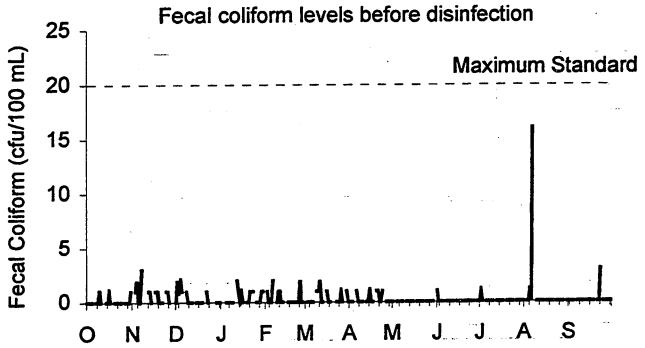
Source Water – Chicopee Valley Aqueduct
Fecal Coliform Levels At Quabbin Reservoir (Winsor Power Station) And Nash Hill Reservoir
September 1998

Quabbin Reservoir water sampled at Winsor Power Station before chlorination represents reservoir water entering the Chicopee Valley Aqueduct (CVA). Samples from Nash Hill Reservoir are collected where CVA water enters the gatehouse. Depending on whether the reservoir is filling or discharging, these samples may contain a mix of aqueduct water with reservoir water. If the reservoir is filling, samples will contain a chlorine residual from chlorination that occurs at Winsor Power Station.

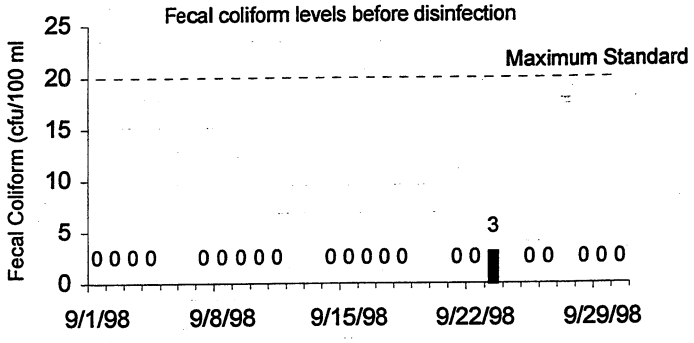
The SDWA requires that no more than 20 fecal coliform/100 ml be present in 10% of the samples over a 6-month period. Results presented here cover the last twelve months and the most recent month.

Fecal coliform levels tend to be low at both Winsor and Nash Hill locations. One of 22 samples collected at Winsor and Nash Hill were positive for fecal coliform. Levels continue to remain below standards.

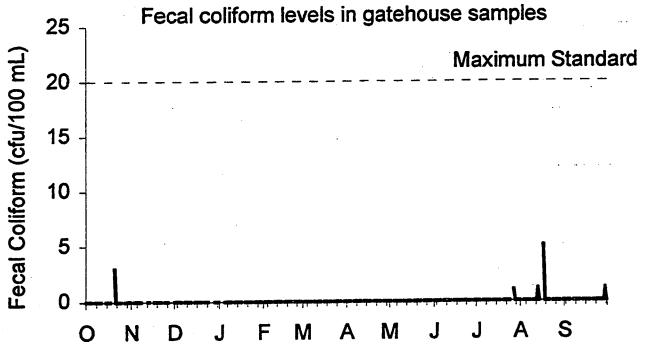
Winsor Power Station, Quabbin Reservoir
Fecal coliform levels before disinfection



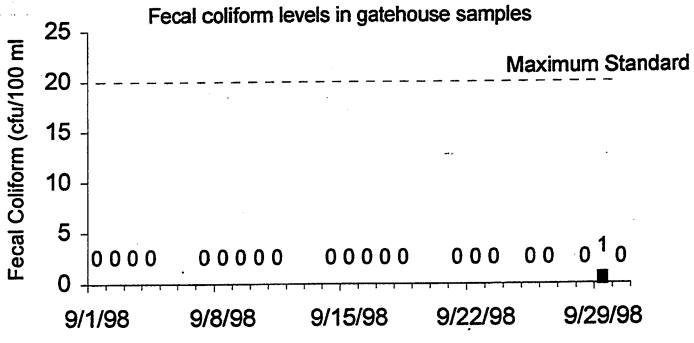
Winsor Power Station, Quabbin Reservoir
Fecal coliform levels before disinfection



Nash Hill Gatehouse
Fecal coliform levels in gatehouse samples



Nash Hill Gatehouse
Fecal coliform levels in gatehouse samples

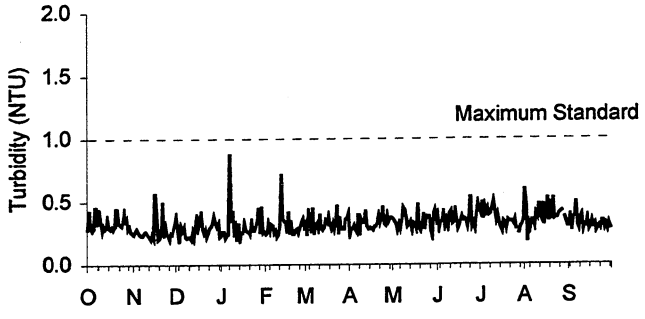


Source Water – Chicopee Valley Aqueduct
Turbidity Levels at Quabbin Reservoir (Winsor Power Station)

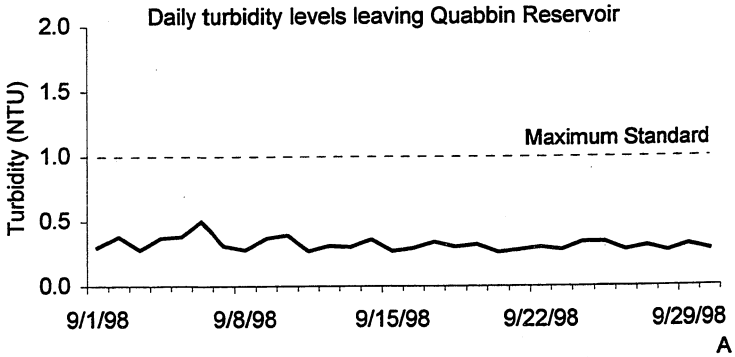
Samples for turbidity are collected at Winsor Power Station before chlorination and represent reservoir water entering the CVA. The Massachusetts Department of Environmental Protection standard for source water turbidity is 1.0 NTU.

Turbidity levels are well below the standards. Occasional spikes in turbidity do occur through the year, often related to rainfall or icing over of the reservoir.

Winsor Power Station, Quabbin Reservoir
Daily turbidity levels leaving Quabbin Reservoir



Winsor Power Station, Quabbin Reservoir
Daily turbidity levels leaving Quabbin Reservoir

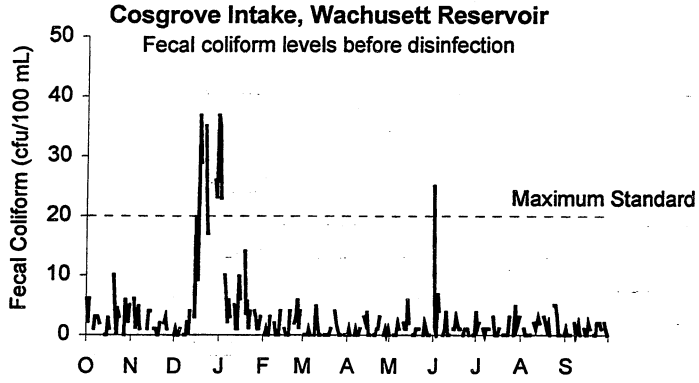


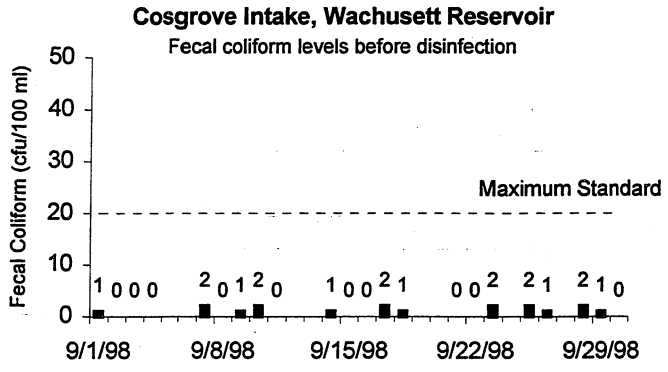
A

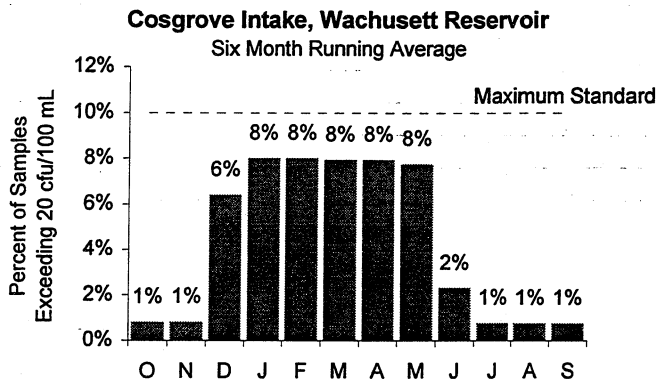
MWRA
Source Water
Fecal Coliform Levels and Primary Disinfection at Wachusett Reservoir
September 1998

Samples from Wachusett Reservoir are collected at a location inside the Cosgrove Intake facility and represent water entering the Cosgrove Tunnel/Aqueduct. The Surface Water Treatment Rule (SWTR) of the SDWA for unfiltered surface supplies requires that no more than 20 fecal coliform/100 ml be present in 10% of the samples over a 6-month period. The six-month running average results represent the percent of samples exceeding the standard during the previous 6-month period.

Coliform levels meet the standards for the current month. Over the year, seasonal increases in coliform levels are observed, usually related to icing over of nearby water bodies and birds visiting Wachusett, which tends to freeze later in the year. The six-month running average is well below the 10% standard.



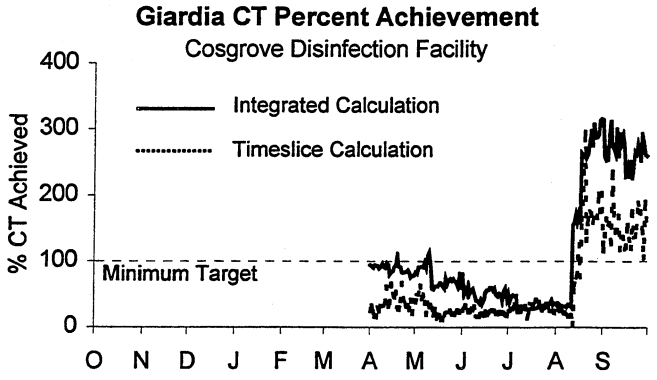


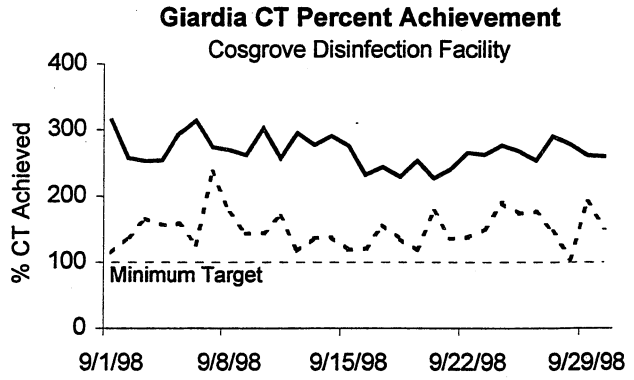


Primary Disinfection
Cosgrove Disinfection Facility

Since September 1997, MWRA has added sodium hypochlorite to source water at Cosgrove Intake to achieve primary disinfection. The concentration (C) of the disinfectant in the water over time (T) yields a measure of the effectiveness of disinfection, concentration x time or CT. CT varies with disinfectant dosage, water temperature, pH, and other factors. EPA requires a CT sufficient to achieve 99.9% inactivation of giardia cysts and 99.99% inactivation of viruses in drinking water. MWRA exceeds virus CT for Cosgrove (results are not presented here).

MWRA uses two methods to calculate daily CT inactivation rates at maximum flow, generally the lowest CT for the day. CT based on a single measurement, or 'timeslice', gives a lower disinfection credit than CT based on an integrated calculation, a more precise measurement. The integrated calculation method permits a lower chlorine dose, which minimizes disinfection by-products in treated water. CT calculations began in April 1998 as chlorine dose ramped up.





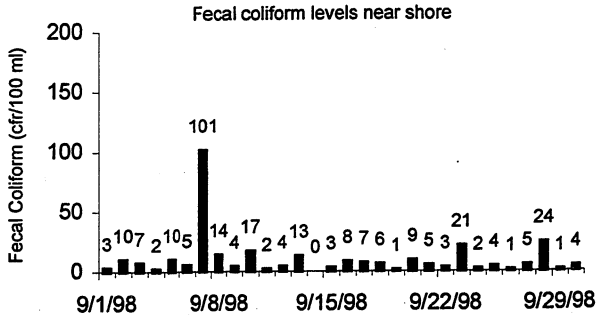
MWRA
Source Water
Fecal Coliform Levels in Norumbega Reservoir
September 1998

Fecal coliform samples from Norumbega Reservoir are collected from the shore near the gatehouse. Flow from Norumbega Reservoir supplements flows from Wachusett Reservoir daily to meet peak demand.

Fecal coliform levels are elevated periodically. Samples are collected from the shore of this small reservoir and are more susceptible to local disturbances. Bird harassment programs are in place to minimize outside contamination.

Norumbega Reservoir
Fecal coliform levels near shore

Norumbega Reservoir
Fecal coliform levels near shore

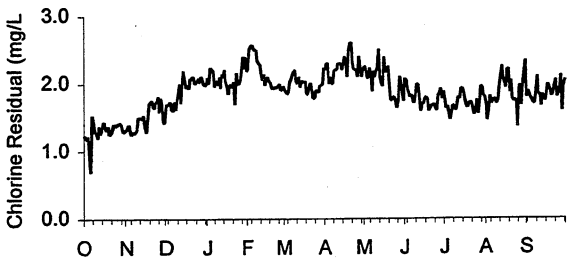


Treated Water
Disinfectant Levels in Hultman Aqueduct at Norumbega Disinfection Facility and Commonwealth Avenue Pump Station (Entry Point to Customer Distribution Systems)

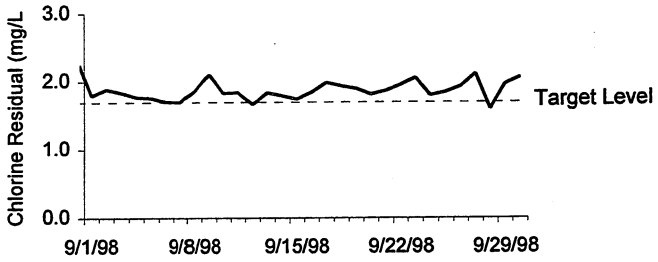
Chloramination at Norumbega Disinfection Facility provides 3-8 minutes of contact time with free chlorine before ammonia addition. Chloramination provides residual disinfection to minimize bacterial regrowth in the distribution system (primary disinfection is now provided at Wachusett Reservoir/Consgrove Intake).

The target for total chlorine residual at Commonwealth Avenue Pump Station is adjusted periodically in an effort to optimize disinfection while minimizing concerns with nitrification, taste and odor, and disinfection by-product (DBP) formation. Total chlorine residuals averaged 1.9 mg/l for the month. Seasonally, chlorine residuals fluctuate due to temperature and dosage changes.

Daily Chlorine Residual
At entry to distribution systems, Comm Ave. PS



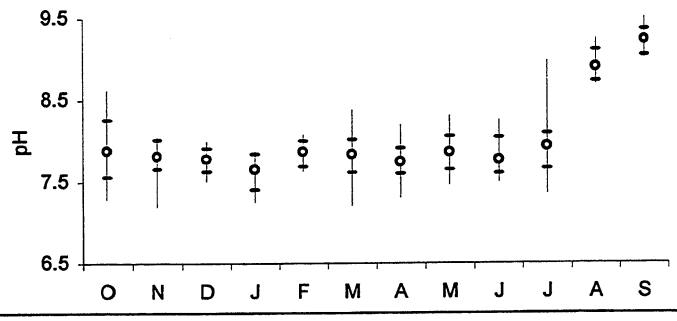
Daily Chlorine Residual
At entry to distribution systems, Comm. Ave. PS



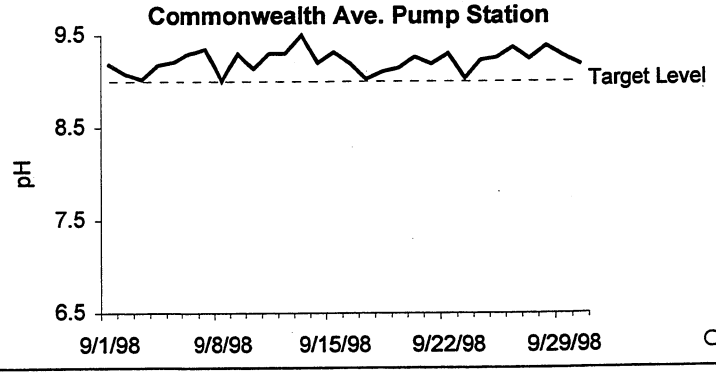
Treated Water
pH Levels at Commonwealth Avenue Pump Station

MWRA adjusts the alkalinity and pH of Wachusett water to reduce its corrosivity in order to minimize the leaching of lead and copper from service lines and home plumbing systems into the water. In June 1996, the Interim Corrosion Control (ICC) facility went on-line and is providing corrosion control to communities east of and including Marlborough. Initial pH targets were 7.5 in June 1996, then 7.8 in February 1997. On July 27, 1998, the pH was adjusted from a target of 7.8 to 9.0 to further minimize corrosion of lead.

Commonwealth Avenue Pump Station
High, Low, 90th & 10th Percentile, and Average pH Values



Commonwealth Ave. Pump Station



C

MWRA
Water Quality Update for Communities Participating in MWRA Testing Program
September 1998

Background
Thirty-two cities and towns use the MWRA Laboratory for Total Coliform Rule compliance testing. These communities collect samples for bacteriological analysis and measure chlorine residual at the time of collection. The other 14 MWRA customer communities have their samples tested elsewhere and these towns should be contacted directly for their results.

The SDWA requires that no more than 5% of all samples may be total coliform positive in a month (or no more than 1 positive when less than 40 samples are collected each month). Public notification is required if this standard is exceeded.

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 are undertaken. Public notification is required if follow-up tests confirm the presence of E. coli or total coliform.

MWRA considers a disinfectant residual of 0.2 mg/L a minimum target level at all points in the distribution system.

Highlights
All thirty-two communities listed below submitted samples with no coliform bacteria during the month of September.

All thirty-two communities that submitted chlorine residual data maintained an average disinfectant residual of at least 0.2 mg/L. Twenty-one communities had one or more samples with a disinfectant residual lower than 0.2 mg/L. Average chlorine residuals in these communities remained significantly above last year's levels.

Town	Samples Tested for Coliform (a)	Total Coliform % Positive	E. coli % Positive	Public Notification Required?	Average Chlorine Residual (mg/L)	Minimum Chlorine Residual (mg/L)
ARLINGTON	56				0.71	0.03
BELMONT	32				0.72	0.10
BOSTON	252				1.43	0.12
BROOKLINE	85				1.50	0.30
CHELSEA	33				1.18	0.01
EVERETT	40				1.53	0.10
FRAMINGHAM (e)	78				1.11	0.02
LEXINGTON	36				1.60	1.30
LYNNFIELD	14				0.61	0.20
MALDEN	60				0.83	0.00
MARBLEHEAD	24				1.18	0.20
MEDFORD	85				0.69	0.10
MELROSE	36				1.00	0.10
MILTON	40				0.37	0.20
NAHANT	10				0.43	0.05
NEEDHAM (c)	51				0.34	0.03
NEWTON	87				1.34	0.30
NORWOOD	40				0.67	0.10
QUINCY	115				0.81	0.10
REVERE	65				0.99	0.10
SAUGUS	40				0.39	0.20
SOMERVILLE	100				1.25	0.10
SOUTHBORO (e)	11				0.83	0.30
STONEHAM	28				1.35	0.50
SWAMPSCOTT	18				1.17	0.05
WAKEFIELD (c)	44				0.75	0.05
WALTHAM	83				1.26	0.60
WATERTOWN	40				0.60	0.10
WELLESLEY (c)	36				0.63	0.00
WESTON (e)	12				0.84	0.53
WINCHESTER (c)	25				0.77	0.04
WINTHROP	24				0.85	0.10
Total:	1700					

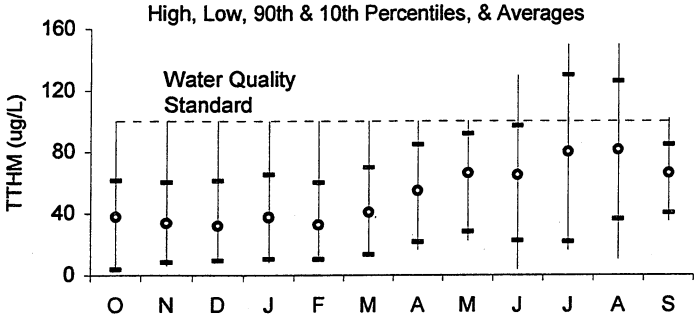
(a) The number of samples collected depends on the population served and the number of repeat samples required.
(b) Less than 5% total coliform positive, therefore public notification not required.
(c) These communities are partially supplied, and may mix their chlorinated supply with MWRA chloraminated supply.
(d) When E.coli is identified and follow-up samples are negative for total coliform and/or E. coli, this is not a violation.
(e) These communities re-chloraminate (since July/August 1998).

MWRA
Treated Water
TTHM Levels in Communities

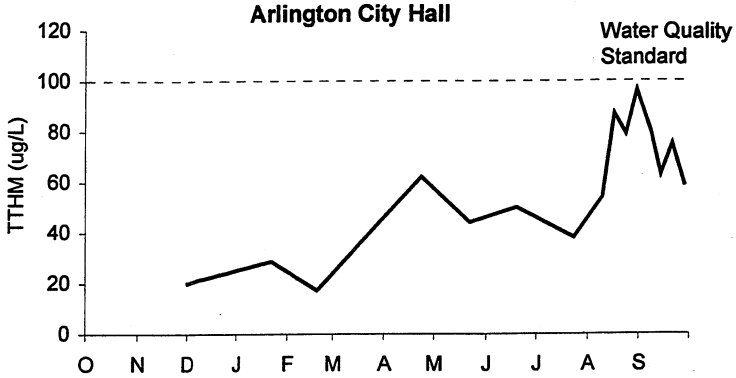
Total Trihalomethanes (TTHMs) are by-products of disinfection treatment. Chlorination levels, the presence of inorganic precursors, pH levels, the contact time of water with chemicals used for disinfection, and temperature all affect TTHM levels. TTHMs are of concern due to their carcinogenic health effects. The TTHM standard currently is an annual running average of 100 ug/L for all samples at city and town hall locations combined.

THM levels increased as the chlorine dose at the Cosgrove Disinfection Facility increased. THM levels declined with optimized operations.

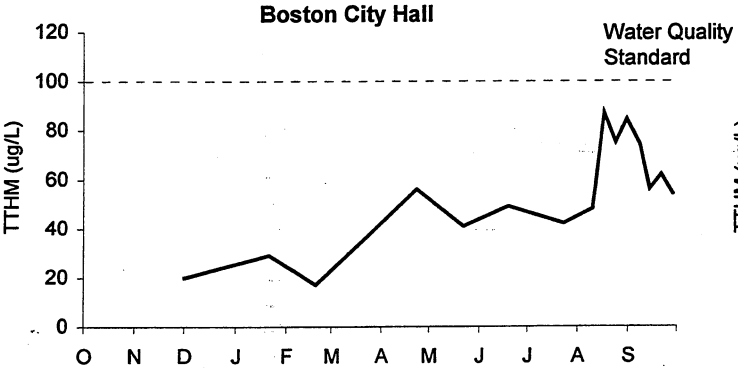
MetroWest Locations
Marlboro, Southboro, Framingham, and Weston
High, Low, 90th & 10th Percentiles, & Averages



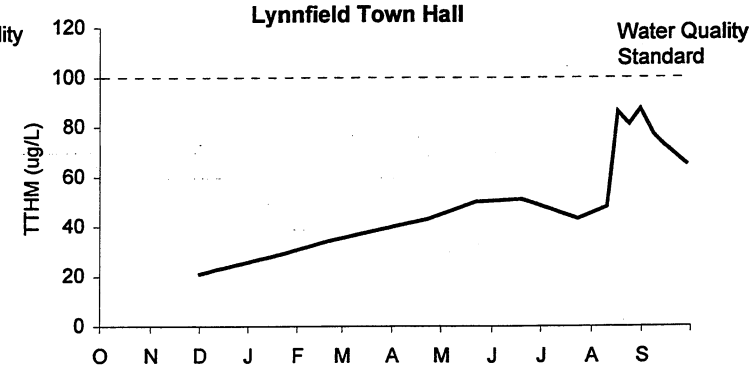
Arlington City Hall



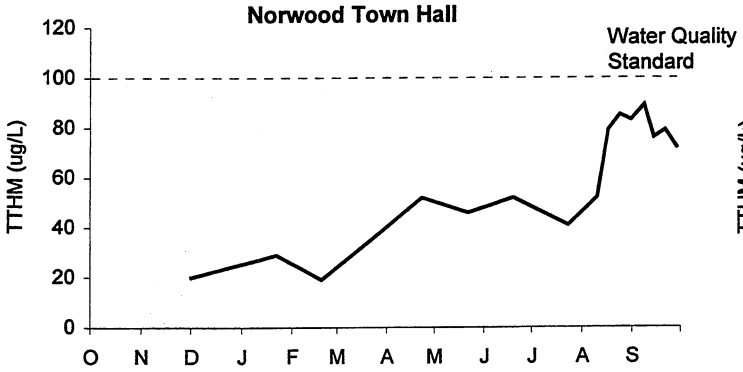
Boston City Hall



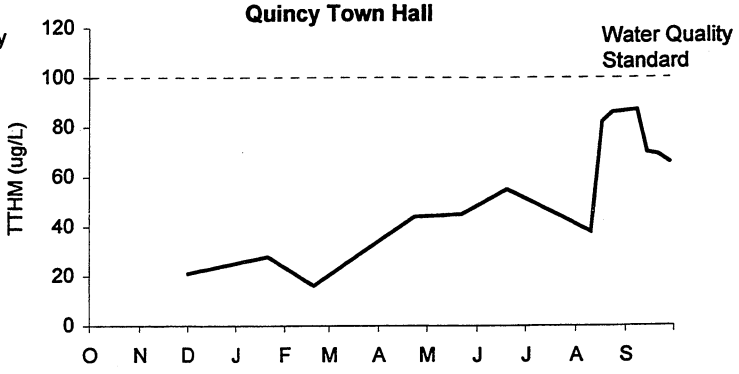
Lynnfield Town Hall



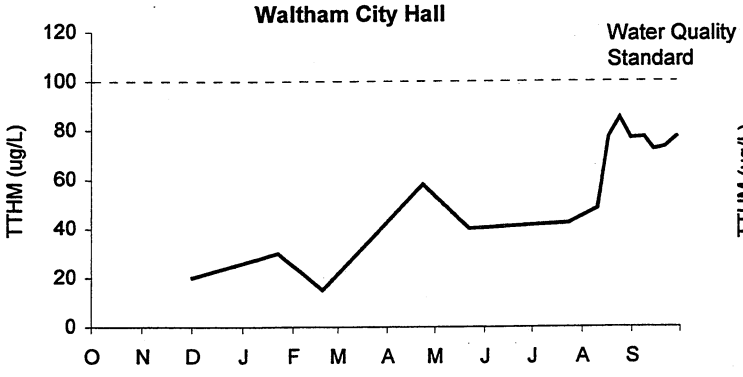
Norwood Town Hall



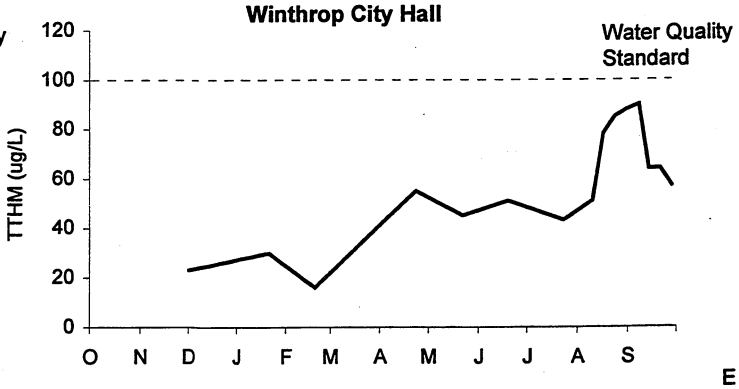
Quincy Town Hall



Waltham City Hall



Winthrop City Hall



Community Average Total Chlorine Residuals

September 1997 and September 1998

Town	1997	1998	Chlorine Complaints September 1998
Arlington	0.19	0.71	2
Belmont	0.31	0.72	0
Boston	0.52	1.43	0
Brookline	0.59	1.50	0
Chelsea	0.27	1.18	0
Everett	0.42	1.53	0
Framingham (c)		1.11	0
Lexington	0.46	1.60	0
Lynnfield	0.36	0.61	0
Malden	0.22	0.83	0
Marblehead	0.47	1.18	0
Medford	0.26	0.69	0
Melrose	0.23	1.00	0
Milton	0.24	0.37	0
Nahant	0.21	0.43	0
Needham (a) (b)		0.34	0
Newton	0.32	1.34	0
Norwood	0.20	0.67	0
Quincy	0.21	0.81	0
Revere	0.22	0.99	0
Saugus	0.28	0.39	0
Somerville	0.15	1.25	0
Southboro (c)		0.75	0
Stoneham	0.43	1.35	0
Swampscott		1.17	0
Wakefield		0.75	0
Waltham	0.57	1.26	0
Watertown	0.23	0.60	0
Wellesley (a) (b)		0.62	0
Weston (c)		0.84	0
Winchester (a) (b)	0.33	0.77	0
Winthrop	0.23	0.85	0

Samples are collected by community samplers and reported to MWRA.

(a) Partially supplied community
(b) Provide local chlorination
(c) Provide local chloramination

All twenty-five of the communities reporting on their chlorine residuals for both years showed higher average levels this year than last year. Disinfection changes at Wachusett Reservoir and Norumbega have increased capacity for pathogen inactivation and have improved chlorine residual levels.

Optimization of the disinfection process has reduced the number of chlorine complaints since early in the year. Total taste and odor complaints numbered 35 in September 1997 and 10 in September 1998. Chlorine complaints totaled 0 in September 1997 and 2 in September 1998.

MWRA Monthly Mineral Analysis

September 1998

This monthly mineral analysis provides information on water quality at four locations in the MWRA transmission system.

Component	Cosgrove Intake at Wachusett Reservoir	ICC, Marlboro	Comm Ave., Newton	Shaft 9A, Malden	MCL Standard	Units	Exceedance
Alkalinity	4.0	33.6	33.4	34.1	35 (33-37) (a)	MG/L	NO
Aluminum	<110	<110	<110	<110	50-200 (b)	UG/L	NO
Ammonia	0.023	0.016	0.286	0.246		MG/L	
Antimony	<40	<40	<40	<40		UG/L	
Arsenic	<0.8	0.82	<0.8	<0.8	50 (c)	UG/L	NO
Barium	7.86	8.02	7.75	7.78	2000 (c)	UG/L	NO
Beryllium	<1	<1	<1	<1	4 (c)	UG/L	NO
Cadmium	<2	<2	<2	<2	5 (c)	UG/L	NO
Calcium	3.61	3.85	3.91	3.96		MG/L	
Chloride	13.3	14.5	16.5	16.4	250 (b)	MG/L	NO
Chlorine, Free	-	0.09	0.06	0.09			
Chlorine, Total	-	0.21	2.06	2.01			
Chromium	<3	<3	<3	<3	100 (c)	UG/L	NO
Coliform, Total, MF Method	Invalid (e)	0	0	0	0 (f)	CFU/100 mL	NO
Color	16	13	12	15	15 (b)	C.U.	NO
Copper	<12	<12	<12	<12	1300 (c)	UG/L	NO
Cyanide	<0.01	<0.01	<0.01	<0.01		MG/L	
Fluoride	0.067	0.981	0.969	0.977	4 (c)	MG/L	NO
Hardness	12.6	12.7	12.9	13.0		MG/L	
Iron	39.3	40.9	43.3	40.2	300 (b)	UG/L	NO
Lead	<2.4	<2.4	<2.4	<2.4	15 (c)	UG/L	NO
Magnesium	744	749	752	752		UG/L	
Manganese	18.8	16.7	14.7	14.2	50 (b)	UG/L	NO
Mercury	<0.05	<0.05	<0.05	<0.05	2 (c)	UG/L	NO
Nickel	<8	<8	<8	<8		UG/L	
Nitrate-N	0.531	0.101	0.097	0.101	10 (c)	MG/L	NO
Orthophosphate	0.0050	0.0076	0.0087	0.0085		MG/L	
pH	6.6	9.0	9.0	8.7	9.0 (8.6-9.2) (a)	S.U.	NO
Potassium	783	780	786	790		UG/L	
Selenium	<0.9	<0.9	<0.9	<0.9	50 (c)	UG/L	NO
Silica (SiO2)	2.47	3.04	2.99	3.02		MG/L	
Silver	<1	<1	<1	<1	100 (b)	UG/L	NO
Sodium	7.94	21.9	22.8	22.7		MG/L	
Specific Conductance	98	162	182	160			
Standard Plate Count, HPC (48 Hrs @ 35C)	265	0	0	0	500 (c)	CFU/mL	NO
Sulfate (SO4)	6.68	6.41	6.43	6.55	250 (b)	MG/L	NO
Thallium	<1	<1	<1	<1	2 (c)	UG/L	NO
Total Dissolved Solids	44	122	82	76	500 (b)	MG/L	NO
Trihalomethanes, Total (TTHMS)	-	42	81	70	100 (c) (g)	UG/L	NO
Turbidity	0.24	0.23	0.22	0.18	1 (d)	NTU	NO
Zinc	<13	<13	<13	<13	5000 (b)	UG/L	NO

(a) = MWRA target level, after ICC facility.
(b) = Secondary MCL standard (aesthetic related). DEP "Drinking Water Regulations", 310CMR 22.00.
(c) = Primary MCL standard (health related). DEP "Drinking Water Regulations", 310CMR 22.00.
(d) = Primary MCL standard (health related), applies to Wachusett Reservoir only (source water). DEP "Drinking Water Regulations", 310CMR 22.00.
(e) = Invalid results occur when more than 200 colonies are present, and the result is too numerous to count.
(f) = Primary MCL standard (health related). DEP "Drinking Water Regulations", 310CMR 22.00. Applies to samples downstream of Wachusett Reservoir.
(g) = THM compliance is based on a running annual average of samples collected at DEP approved locations.

MCL = Maximum Contaminant Level
CFU = Colony Forming Unit
S.U. = Standard Units
ug/L = micrograms per liter = parts per billion
C.U. = Color Unit
NTU = Nephelometric Turbidity Unit
mg/L = milligrams per liter = parts per million
< = less than method detection limit

These results are based on single grab samples collected September 1, 1998 and analyzed by MWRA laboratories.

FREQUENCY OF SOURCE WATER QUALITY SAMPLING PROGRAM

PARAMETER	MWRA SAMPLES
Total and Fecal coliform	daily at source reservoirs, weekly in distribution reservoirs
Turbidity	daily at source and distribution reservoirs
pH	daily at distribution reservoirs
Chemical analyses	periodically as required under SDWA
Radionuclides	as required, currently every five years

FREQUENCY OF TREATED WATER QUALITY SAMPLING PROGRAM

PARAMETER	MWRA SAMPLES	COMMUNITY SAMPLES
Total coliform	weekly at select locations	frequency and number depends on population served
Disinfectant Residual	weekly at select locations	collected with total coliform samples
pH	weekly at select locations	

Customer communities must also meet certain standards under the SDWA concerning distribution of treated drinking water. The Total Coliform Rule (TCR) helps to alert the local water suppliers to possible local distribution system issues as well as the adequacy of residual disinfection. MWRA provides testing services for many of the communities, and tests over 1500 samples per month. Under the SDWA, a violation of the TCR occurs when greater than 5% of the samples are positive for total coliform.

DISINFECTANT RESIDUAL

The effectiveness of disinfection is calculated by determining the length of time water is in contact with a specific dosage of disinfectant. This calculated value is commonly called CT (Concentration multiplied by Time) and is derived mathematically from assumptions about the residual disinfectant dosage in the water as it reaches the user multiplied by the travel time from the point of application of the disinfectant.

The required CT to provide target inactivation varies somewhat due to ambient pH or temperature conditions, as well as the strength of the disinfectant, *e.g.* free chlorine has greater pathogen inactivation properties than chloramines in the same concentration. The calculated CT of the disinfection system is then compared to the required values necessary to achieve the desired level of inactivation of key pathogens such as bacteria, viruses, and protozoa. In this classification of pathogens, bacteria are the most prevalent and are the first focus of disinfection. Fortunately, harmful bacteria are relatively easily inactivated by chlorination. Viruses are more resistant to chlorination. *Giardia* and *cryptosporidium* are examples of pathogenic protozoa that are particularly difficult to inactivate using normal dosages of chlorine but are less commonly found in source waters.

The reduction of residual disinfectant levels within a pipeline system is affected by a variety of factors including temperature, presence of organic matter in the water or on the pipe surface and corrosion of the pipe surface. For residual disinfection, MWRA uses a chlorine-ammonia combination to form chloramines, a longer-lasting residual disinfectant than free chlorine alone. The level of the residual disinfectant is measured throughout the distribution system using a colorimetric test by which a color change in the sample is compared to a color chart in order to estimate the disinfectant concentration within a reasonable degree of accuracy.

GLOSSARY

CHLORINATION: Disinfection by adding chlorine.

CHLORAMINATION: Disinfection by adding a mixture of chlorine and ammonia.

COLIFORM BACTERIA: Group of bacteria that indicate the possibility of contamination in a water supply. A subclass of the coliform group, fecal coliform bacteria, indicate possible contamination from intestinal sources.

CORROSION CONTROL FACILITY: Water quality facility that helps to stabilize both the water's pH and alkalinity by adding soda ash and carbon dioxide.

CRYPTOSPORIDIUM: Microscopic protozoa which, when ingested, can result in diarrhea and other flu-like symptoms.

ESCHERICHIA COLI (E. COLI): A bacterium that is a primary indicator of fecal contamination in a water supply. *E. coli* is a member of the coliform group of bacteria.

GIARDIA LAMBLIA: Microscopic protozoa which, when ingested, can result in diarrhea and other flu-like symptoms.

NTU: Nephelometric turbidity unit. A standard measure of turbidity in a water sample.

PATHOGENS: Disease-causing organisms.

RESERVOIR: A natural or man-made basin where water is collected and stored in large quantities before being supplied to a community.

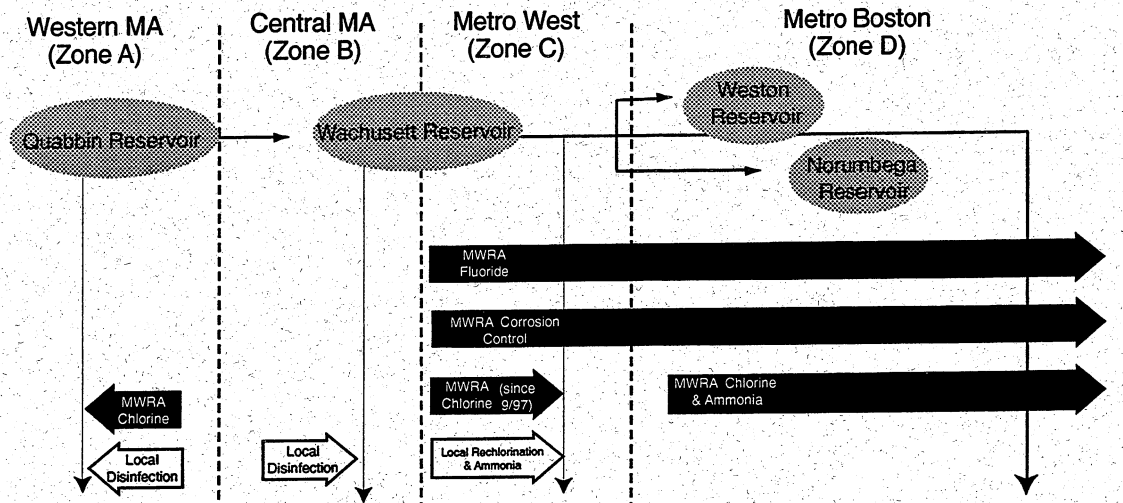
SAFE DRINKING WATER ACT (SDWA): Federal drinking water quality regulations.

TOTAL COLIFORM RULE (TCR): SDWA standard that limits the level of total coliform positive results allowed each month in a community.

TURBIDITY: Measure of the particulate matter in a water sample.

MWRA WATER SUPPLY AND TREATMENT

Communities that are fully supplied by MWRA receive water treated with chloramines. In those communities that are partially supplied by MWRA, information on treatment should be obtained from the local water department. To view the level of treatment your water has received, locate your community on the chart.



Chicopee
S.Hadley FD1
Wilbraham

These communities do not receive treated water from MWRA.

Clinton - Treats water drawn from Wachusett.
Leominster* - Standby. Uses and treats Wachusett water only in emergencies.
Northborough* - Draws and treats raw water from a service connection on the Wachusett Aqueduct.
Worcester* - Standby. Uses and treats water drawn from the Quabbin Aqueduct only in emergencies.

Framingham
Marlborough*
Southborough
Weston[1]

During 1998, these communities began using chlorinamines for residual disinfection beginning in late July/early August,1998.

Arlington
Bedford*
Belmont
Boston
Brookline
Cambridge
Canton*
Chelsea
Everett
Lexington
Lynn (GE plant only)
Lynnfield WD
Malden
Marblehead
Medford
Melrose
Milton
Nahant
Needham*
Newton
Norwood
Peabody*
Quincy
Revere
Saugus
Somerville
Stoneham
Swampscott
Wakefield*
Waltham
Watertown
Wellesley*
Winchester*
Winthrop
Woburn*

* Partially supplied communities mix their supplies with MWRA chloraminated supply.
1 Weston Reservoir has been off line since June, 1985.

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