CITY OF DURHAM
DEPARTMENT OF WATER MANAGEMENT

DURHAM
1869
CITY OF MEDICINE

WATER QUALITY REPORT 2012

The Value of Every Drop

DrinkTap.org

EPA WaterSense PARTNER

INSIDE THIS REPORT

Most of us take our tap water for granted. We turn on the faucet at work or at home and clean, fresh drinking water flows out. And we expect that to happen every time. Water Management employees work 24/7/365 to ensure that it does. However, we also want our customers to understand the effort that goes in to producing those valuable droplets as they flow from the tap. So we invite you to join us on the journey of a water drop — from the lakes that supply the water to your tap — and learn about the processes and practices that we implement every day to deliver our product to you (page 3).

Beyond the water treatment processes and the distribution system, we have implemented a number of safeguards to protect the water supplied to your tap. One of those lesser known programs is our Cross-Connection Control (CCC) program. What is a cross-connection, you may ask? A cross-connection is a link between the drinking (potable) water system and a non-potable water source. Contamination may occur when a cross-connection exists and other conditions occur that cause or create a "backflow" into the drinking water supply. Backflow or back-siphonage can occur when water pressure is reduced due to a water main break and contaminated water is pulled back into the plumbing system. For example, a homeowner decides to use an herbicide to kill weeds, using a spray applicator and hose. If the hose bib does not have a built in vacuum breaker AND there's a drop in water pressure, the herbicide could backflow into the home or the City's system. Other potential culprits in a home are jacuzzis and swimming pools.

To protect the system, the City has a comprehensive CCC program that requires the installation and maintenance of appropriate backflow prevention devices (BFP). For residential customers, the most common application for a BFP would be for an irrigation system. Commercial, industrial and institutional buildings require very sophisticated BFPs that are selected to protect against potential hazards of the activities conducted by the customer. The City's CCC program also requires annual testing of all BFPs to ensure they are in proper working order to protect the water that flows from your tap. To learn more about this program, visit www.DurhamSavesWater.org.

Another measure we take to ensure water quality is highly visible but misunderstood . . . the City's flushing program. As you probably know, once each year – usually in March – the City changes the disinfection process from chloramines to chlorine only. After changing the chemicals, crews flush the entire distribution system over a three to four week time frame. The use of chloramines as the disinfection method resumes after 31 days. During the remainder of the year, customers may occasionally see a fire hydrant or two running, with a sign attached stating "flushing for water quality." Crews are periodically dispatched to specific areas to conduct spot flushing to address water quality in dead ends, such as cul-de-sacs, or when the pipes have been disturbed due to construction activities or when there has been a water main break. Typically this flushing process lasts one to two days and crews monitor the hydrants daily. When new or replacement water lines are constructed, the lines are disinfected and once the lab analysis is completed, they too are flushed completely before being placed into service. All of these activities are designed to ensure that customers are receiving the safest, freshest water from their taps.

Please be assured that Water Management employees are aware of the value of every drop and are committed to delivering a high quality product in a cost-effective manner. Just as we encourage customers to use our most precious natural resource wisely, we embrace the "Water – Use it Wisely!" ethic each and every day. As you review this year's report, please feel free to contact any of our staff by phone or email for additional information.

Best regards,

WATER USE IT WISELY®

Don Greeley
Director, Department of Water Management

Questions?

Questions regarding the information in this report should be directed to Water Management staff at the Brown Water Treatment Plant, **919-560-4362**. For information on water conservation or to arrange a tour of facilities, call **919-560-4381**. Call **919-560-4411** for all billing questions. For information about City operations and services, contact **Durham One Call** at **919-560-1200**.

Tap Water Compliance History

We are pleased to report that the City of Durham's tap water had **zero** violations of any water quality standards during 2012. The substances detected were all below the designated levels allowed by the Environmental Protection Agency (EPA). The City is required to test for more than 150 different compounds in the drinking water; those listed in the tables in this report are just a fraction of the total number of required and voluntary analyses conducted each year.

Sources of Drinking Water

The sources of drinking water – both tap and bottled – include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over land or through the ground, minerals and other materials are dissolved naturally. Water can also pick up substances that are the result of animal or human activity. Source water may contain the following:

- microbial contaminants, such as viruses and bacteria;
- inorganic contaminants, such as salts and metals;
- pesticides and herbicides from agriculture or urban run-off;
- organic chemicals from industrial processes or run-off; and
- radioactive contaminants that can be naturally occurring.

To ensure that tap water is safe to drink, the EPA regulates the amount of certain substances in your tap water we provide. The Food and Drug Administration establishes limits for contaminants in bottled water to protect public health.

Durham's Drinking Water Sources

Durham is fortunate to have two high quality surface water sources. Lake Michie, built in 1926, was the City's main water source until the Little River Reservoir was constructed in 1988. Using recent modeling of the reservoirs, which takes into account the extreme drought conditions of 2007-08, the City has adjusted the operational yield of the two lakes. With a 20 percent safety factor, the yield used for planning purposes is 27.9 MGD. For most reporting purposes however, the yield of the two lakes is considered to be 34.4 MGD.

For that reason, the full utilization of the City's additional water sources, Jordan Lake and Teer Quarry, becomes a higher priority. In 2002, the City of Durham obtained an allocation of approximately 10 MGD from Jordan Lake, another local high quality water source. Currently, Durham accesses this water on an as-needed basis via the Town of Cary's water system. With regional partners, Durham is exploring opportunities to build an additional intake at Jordan Lake. The City also obtained the Teer Quarry for use as off-line water storage. Water stored in the quarry was accessed for emergency purposes during the drought of 2007-08. Permanent facilities to allow filling the quarry from a number of sources during normal conditions are in the design phase.

Teer Quarry

Water may be transferred from the two supply lakes to the City's two treatment plants by gravity flow, hydropower or electric power. Terminal reservoirs at each water treatment plant hold about a two- to three-day supply of water.

How is Durham's water treated?

Durham's two drinking water facilities provide water to approximately 258,636 people in Durham City and County. The oldest facility is the Williams Water Treatment Plant on Hillandale Road, which was built in 1917. It has been expanded and upgraded a number of times and has a current capacity of 22 MGD. The Brown Water Treatment Plant on Infinity Road was built in 1977 and has a current capacity of 30 MGD.

Both plants operate using optimized conventional water treatment processes. The initial treatment step is coagulation, which involves the rapid mixing of caustic and ferric sulfate into the raw (untreated source) water. Next, the water flows into chambers where gentle mixing allows particles to stick together or flocculate. The heavy floc particles that have formed then settle and are removed in sedimentation basins. Chlorine is added to the settled water as a disinfectant. The water then flows through sand and anthracite filters to remove any remaining particles. Phosphate (a corrosion inhibitor) and fluoride (for dental health) are then added. In the final step, chlorine and ammonia are combined to form chloramines, which serve as the distribution system's residual disinfectant.

The City of Durham has added fluoride to its drinking water since 1957 to promote dental health. Until recently, state regulations required a target concentration of 1.0 mg/l for fluoride. However in 2010, the EPA — in conjunction with the Centers for Disease Control — determined that dental health could still be maintained with lower levels of fluoride. Based on this, N.C. regulators have allowed water systems to decrease their fluoride target levels to 0.7 mg/l. The City changed dosage levels for fluoride immediately upon receiving approval. Testimony from public health experts supports the continued addition of fluoride to drinking water as an ongoing safeguard for dental health.

SUBSTANCE AND UNIT OF MEASUREMENT	MAX. LEVEL DETECTED AND RANGE	VIOLATION YES/NO	MAX. LEVEL ALLOWED (MCL)	IDEAL GOAL (MCLG)	POTENTIAL SOURCE(S) OF SUBSTANCE
REGULATED AT THE TREATMENT PLANTS					
Fluoride mg/L	0.73 (0.71 - 0.75)	NO	4.0	4.0	Naturally occurring mineral; also added to promote dental health
Nitrate mg/L (as Nitrogen)	<0.13 (< 0.10 – 0.18)	NO	10.0	10.0	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Turbidity NTU	0.08 (0.07 - 0.09)	NO	TT	N/A	Soil runoff
Turbidity, % of monthly samples ≤ 0.3 NTU	100%	NO	95%	100%	Soil runoff
Total Organic Carbon mg/l (TOC) Results show the range of TOC in both source and treated water. Durham's processes remove more than the required 50%.	Average Removal 58.2% Source 6.69 (5.39 –8.17) Treated 2.80 (1.66 – 3.45)	NO	NR	TT 50% removal	Naturally present in the environment
Alpha emitters pCi/L (Samples collected & analyzed February 2008). Sampled every 5 years.	None detected (no range)	NO	15	0	Erosion of natural deposits
Beta/photon emitters pCi/L (Samples collected & analyzed February 2008). Sampled every 5 years.	None detected (no range)	NO	50	0	Decay of natural and man-made deposits
REGULATED AT THE CUSTOMER'S TAP					
Copper mg/L (EPA required triennial sampling conducted in July – September 2010)	< 0.05 (90th percentile)	NO	AL=1.3	1.3	Corrosion of household plumbing systems None of the targeted 87 sampling sites exceeded the Action Level
Lead mg/L (EPA required triennial sampling conducted in July – September 2010)	< 0.003 (90th percentile)	NO	AL=0.015	0	Corrosion of household plumbing systems None of the targeted 87 sampling sites exceeded the Action Level
REGULATED IN THE DISTRIBUTION SYSTEM					
Chloramines mg/L (as Cl_2)	2.6 RAA (Running Annual Average)	NO	MRDL 4.0	MRDLG 4.0	Water additive to control microbes
Chlorine mg/l	2.2	NO	MRDL 4.0	MRDLG 4.0	Disinfectant to control microbes; used only in March 2012 during annual disinfection changeover
Total Coliform Bacteria (as a percent)	0.5% positive	NO	< 5% positive	0% positive	Naturally present in the environment
Five Haloacetic Acids (5HAA) µg/L	28 – System Average (18 – 41)	NO	60	0	By-product of drinking water disinfection
Total Trihalomethanes (TTHM) µg/L	48 – System Average (29 – 63)	NO	80	0	By-product of drinking water disinfection
UNREGULATED SUBSTANCES					
Sodium mg/L	28.0 (20.4 – 33.7)	NO	NR	20 DWEL	Naturally occurring element in soil and water
Sulfate mg/L	44 (34 – 54)	NO	NR	250	Naturally occurring mineral in soil

The City of Durham (PWSID # 03-32-010) routinely monitors for over 150 contaminants in your drinking water according to Federal and State laws. The table above lists all the drinking water contaminants that were *detected* during **testing conducted from January 1 through December 31, 2012**. The EPA or the State requires water providers to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, while representative of water quality, is more than one year old.

ELEMENTS OF INTEREST

SUBSTANCE, UNIT OF MEASUREMENT	ANNUAL AVERAGE
pH, standard units (range)	7.3 – 7.7
Alkalinity, mg/L	26
Calcium, mg/L	5.5
Chloride, mg/L	12.2
Conductivity, micromhos/cm	206
Hardness - Calculated, mg/L	23
Hardness - EDTA, mg/L	26
Orthophosphate, mg/L (as phosphorus)	0.84
Potassium, mg/L	2.4
Total Solids, mg/L	126
Zinc, mg/L	0.71

KEY TO ABBREVIATIONS IN TABLE

mg/L milligrams per liter, or parts per million

MCL Maximum Contaminant Level; the highest level of a contaminant that is allowed in drinking water

MCLG Maximum Contaminant Level Goal; the level of a contaminant in drinking water below which there is no known or expected risk to health

MRDL Maximum Residual Disinfectant Level; the highest level of a disinfectant allowed in drinking water

MRDLG Maximum Residual Disinfectant Level Goal; the level of a drinking water disinfectant below which there is no known or expected risk to health

AL Action Level; the concentration of a contaminant, which if exceeded, triggers treatment or other requirements that a water system must follow. Action Levels are reported at the 90th percentile for homes at greatest risk

TT Treatment Technique; a required process intended to reduce the level of a contaminant in drinking water

µg/ L micrograms per liter, or parts per billion

pCi/L Picocuries per liter; a measure of the radioactivity in water

NTU Nephelometric Turbidity Units; measures the clarity or cloudiness in water

N/A Not Applicable

NR Not Regulated

< Less Than

DWEL North Carolina guidance Drinking Water Equivalent Level

***Special Note**: MCLs are set at very stringent levels. To understand the possible health effects described for many regulated constituents, a person would have to drink 2 liters of water every day at the MCL level for a lifetime to have a one-in-a-million chance of having a potentially adverse health effect.*

Poster Contest Winner

Chelsea Castor

2nd Place

Grade 6-8

Immaculata Catholic School

SPECIAL INTEREST INFORMATION

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline at (800) 426-4791.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial organisms are available from the Safe Drinking Water Hotline at (800) 426-4791.

What is Cryptosporidium?

Cryptosporidium (Crypto) is a microbial parasite that comes from animal wastes and occurs naturally in rivers and lakes throughout the United States. Controlling and minimizing development and animal activities in our watershed reduces the occurrence of Crypto in source water. This microscopic organism is typically effectively removed by the water treatment process combination of filtration, sedimentation and disinfection. However, when ingested, Crypto can cause fever, diarrhea, and other gastrointestinal symptoms. Durham monitored source water for Crypto as a part of the Information Collection Rule in the late 1990s and began monthly monitoring in fall 2006 as a part of the Long Term Two Enhanced Surface Water Treatment Rule (LT2SWTR). Crypto has not been detected in any monitoring events to date; long term, the results of monitoring will determine whether or not additional treatment will be necessary.

Lead and Drinking Water

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The Department of Water Management is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available on the EPA's website at www.epa.gov/safewater/lead, the Safe Drinking Water Hotline or at or the City's website at www.durhamnc.gov/departments/wm/lead.cfm. The City will be conducting its required triennial Lead and Copper testing in the summer of 2013. Results of this sampling will be posted on the City's website in October and will be included next year's annual water quality report.

Each year the Department of Water Management invests millions of dollars in the City's infrastructure as a part of the annual Capital Improvement Program (CIP). Water system and facility rehabilitation and upgrades make up between 40 and 50 percent of the department's overall funding requests. CIP and operational costs are supported by water and sewer rates. Projects of this size and scope generally take several years to complete as they move from design through permitting and construction to completion.

Optimized Processing

Process treatment upgrades are underway at both the Williams Water Treatment Plant (WTP) and the Brown WTP. A key objective of these improvements is to reduce the formation of disinfection byproducts (DBPs) in the distribution system. The change to chloramines in the disinfections process (in 2002) has already significantly reduced DBPs to well below the levels allowed. However, the process upgrades will provide an even greater margin of safety. (see substance table on page 4 for more information on DBPs).

Tap water from the Brown Water Treatment Plant was selected as the third tastiest in the state at the NC AWWA-WEA's annual conference held in Raleigh in November 2012.

Angier Tank Construction

More Treatment Capacity

In another major CIP project being built in concert with the WTP upgrades, the Brown WTP's treatment capacity will be increased by 12 MGD for a maximum treatment plant capacity of 42 MGD. Another regulatory required project underway is the residuals dewatering and backwash treatment upgrade at both treatment plants. A pilot project evaluating several types of residuals dewatering equipment was conducted during 2012 at the Brown WTP. The project has now moved into the master planning/design phase.

Elevated Storage Tank

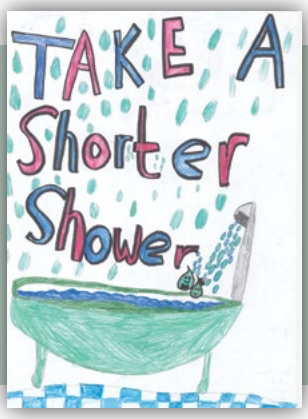
In March 2012, the City broke ground for the 3.0 MG Angier elevated storage tank in southeast Durham. This project is approximately 75 percent complete and is scheduled to come on line in the fall of 2013. When placed in service, the tank will improve system pressure and provide a significant increase in fire suppression capacity in its service area.

Infrastucture Replacement and Rehabilitation

The CIP also funds those "out of sight – out of mind" projects such as major water distribution system replacement and rehabilitation projects. One major project completed during the year is Morris Street Water Line Replacement project in downtown Durham. The water lines in this area of Durham were originally installed in the 1930s. In the space of about three months, approximately 1,500 linear feet of water line was replaced along Morris Street, starting at West Chapel Hill Street and ending at Corporation Street. Multiple interconnections with existing water lines were also completed. This project increases the amount of water available for fire suppression and will allow for future development in the area.

More Efficient Meters

As of December 31, 2012, approximately 43,000 customer meters have been replaced with remote, electronically read meters. This means that about 60 percent of the billing districts are AMR (Automated Meter Reading); with a scheduled date for completion of May 2014 (100 percent AMR). Several billing districts have already been converted to monthly; districts will continue to transition to monthly billing as more portions of the system are converted to AMR.

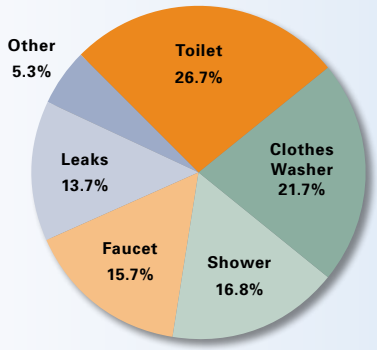


Poster Contest Winner

Emma Burson

1st Place
Grade K-2
Trinity School of Durham

Average Indoor Residential Water Use (U.S.)

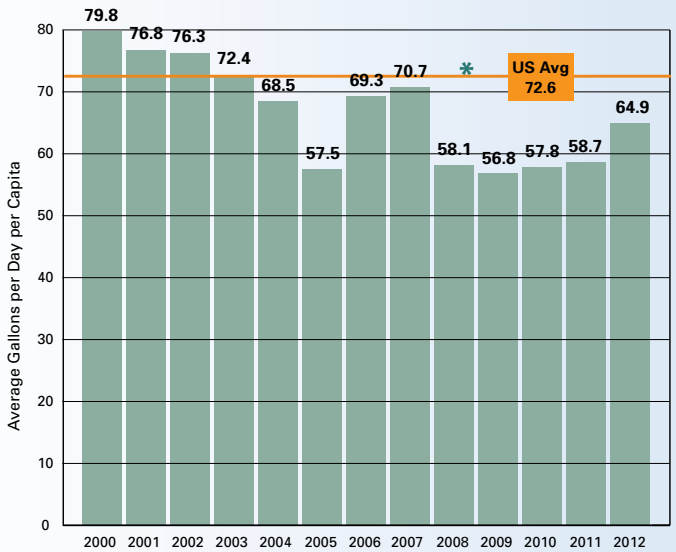


Did You Know . . .

- Toilet use makes up the largest portion of indoor water use in the US at 26.7%? (See pie chart)
- A bathroom makeover with WaterSense labeled products can save you as much as 7,000 gallons annually?
- Since the beginning of the rebate program (2008), approximately 4,300 toilets were replaced with WaterSense labeled High Efficiency Toilets (HETs) through Durham's HET Rebate Program?
- Durham has saved nearly 17 million gallons since 2008 through residents participating in the HET Rebate Program?
- Durham's residential per capita (per person) water use has consistently been below the national average? This is due to customer awareness (post-drought), use of water efficient devices/fixtures in new construction and incentives such as the toilet rebate program.

Annual Average Water Usage Per Capita

(Residential/Multi-Family)



* Prior to Mandatory Restrict ions, water usage was elevated due to extreme heat and extended dry conditions. For August 2007: Number of Days > 95° F: 18; Number of Days of Zero Precip: 28

Education Fast Facts . . .

- Our outreach/education staff communicated the Value of Every Drop to approximately 4,000 children and adults in Durham during 2012 through:
  - Participating in activities and events at 13 different Durham area schools and universities
  - Exhibiting at community events such as Durham's Earth Day Festival and CenterFest
  - Sponsoring an annual water conservation themed poster contest
  - Conducting workshops during national "Fix a Leak Week"
  - Scheduling tours of water treatment facilities

Poster Contest Winner

Helene Worthington

1st Place

Grade 3 – 5

Durham Academy

- Durham's poster contest winners have successfully competed at the state level (through the NC American Water Works Association-Water Environment Association), with most placing either first, second or third for the last 14 years.
- This year's poster contest theme – Reduce Your Water Footprint – elicited 377 entries from 14 different schools. **Winning entries are displayed throughout this report.** To view all entries, visit the City's website http://durhamnc.gov/ich/op/dwm/Pages/Water-Conservation-Poster-Contest.aspx.

Source Water Assessment Program (SWAP Results)

The NC Department of Environment and Natural Resources (DENR), Public Water Supply Section (PWSS) administers the State's Source Water Assessment Program (SWAP). As such, they conduct periodic assessments of all drinking water sources across North Carolina. The purpose of the assessments is to determine the susceptibility of each drinking water source (well or surface water intake) to potential contaminant sources (PCS). PCSs include activities such as animal operations, septage disposal sites, old landfill sites and underground storage tanks that are located in Durham, Person and Orange counties — the watersheds of Lake Michie and Little River.

The final susceptibility rating for Durham's water sources was determined by combining the contaminant rating and the inherent vulnerability rating. The Contaminant Rating is based on the number and locations of PCSs within the assessment area. Inherent Vulnerability refers to the geologic characteristics or existing conditions of the surface water sources and other aspects of the watershed such as watershed classification and development activities. A susceptibility rating of "higher" does not imply a poor water quality — only the systems' potential to become contaminated by identified PCSs in the assessment area. The assessment findings are summarized in the following table.

SWAP Results Summary for Durham
Report updated February 22, 2010

Source Name	Lake Michie	Little River Reservoir
Inherent Vulnerability Rating	Lower	Moderate
Contaminant Rating	Higher	Higher
Susceptibility Rating	Moderate	Higher

For the full report, visit www.deh.enr.state.nc.us/pws/swap. To obtain a printed copy of the SWAP report, please mail a written request to: Source Water Assessment Program – Report Request, 1634 Mail Service Center, Raleigh NC 27699-1634, or email a request to swap@ncmail.net. Please indicate the system name (City of Durham), PWSID (03-32-010), and provide your name, mailing address and phone number. If you have any questions about the SWAP report please contact DENR's Source Water Assessment staff by phone at 919-715-2633.

Lake MIchie Dam

Water Management uses social media to provide useful water-related information to many Durham residents. Follow us at www.facebook.com/durhamsaveswater for tips and updates.

Notice Under the Americans with Disabilities Act

Persons who require assistance should call 919-560-4197, TTY 919-560-1200, or e-mail ADA@DurhamNC.gov no later than 48 hours before the event.

Aviso bajo el Acto de Americanos Discapacitados

Personas que requieran asistencia deben llamar 919-560-4197, TTY 919-560-1200, o enviar un correo electronico ADA@DurhamNC.gov por lo menos 48 horas antes del evento.

Community Participation

Do you have an interest in how decisions regarding Durham's water system or other City issues are made? The public is welcome to attend regularly scheduled meetings of Durham's City Council. Council meetings are held the first and third Monday of each month at 7 p.m. City Council members also have regular work sessions to prepare for Council meetings. These sessions occur on Thursdays — two weeks prior to each regular Council meeting. Work sessions are held at 1 p.m. in the Council's Committee Room on the second floor of City Hall. Council meetings are held at City Hall in the Council Chambers on the first floor. Check the City's Web site to confirm meetings at www.durhamnc.gov. City Hall is located in downtown Durham at 101 City Hall Plaza.