BNL Drinking Water: Step by Step From Source to Finished Product

STEP 1A. Wells 4, 6, and 7 provide high-iron source water which must be "finished" at BNL's Water Treatment Facility (WTF). At one of these wells, Phil Pizzo performs preventive maintenance on a pump motor. — CN10-144-00

STEP 1B. Wells 10, 11, and 12 pump low-iron water not requiring treatment. Instead, this water is put through activated carbon filters to remove volatile organic compounds. It is then chlorinated and pH adjusted before entering the water distribution system. Noting the pressure of the carbon filtration system is Richard Lutz. — CN10-147-00

STEP 2. Chlorine is added water from wells 4,6, and 7 to kill microbes and oxidize iron. Inspecting a liquid sodium hypochlorite storage tank is Joe Tullo. — CN10-143-01

STEP 3. Aeration reduces carbon dioxide gas and aids in iron oxidation. At the aeration tank, Phil Pizzo and Greg Stawski sample the water. — D2850306

STEP 4. Lime is added to raise the pH and soften the water. Feeding lime into the hopper is Greg Stawski. — D2800306

STEP 5. Polymer is added to aid in flocculation (see step 6). Richard Lutz (front) adds polymer into a rapid-mix tank, as Phil Pizzo adjust the flow rate. — D2810306

In the control room of BNL's Water Treatment Facility (WTF), Bldg. 624 on Upton Road, is Richard Lutz. — D2820306

Although BNL's "raw" water comes from six on-site drinking-water wells drilled into the Upper Glacial aquifer (see page 3), the Lab's "finished" drinking water is produced with pride by the staff of BNL's Water Treatment Facility (WTF) of the Plant Engineering (PE) Division.

Producing BNL's finished water are six water-treatment engineers, each having New York State Department of Health (NYSDOH) grade IIA certification. In alphabetical order, they are: Tom Boucher, Jack Kulesa, Richard Lutz, Phil Pizzo, Greg Stawski, and Joe Tullo. They are supervised by Water System Supervisor Tony Ross, who is NYSDOH grade IA certified. WTF operations are overseen by Plant Engineering's Assistant Division Manager for Operations & Environment Bill Chaloupka, PE.

To make what is called potable water for BNL's daily transient and resident population of approximately 3,000 people , WTF staff employ "federal public water system no. 511891." The centerpiece of this system is the WTF itself, located in and around Bldg. 624 on Upton Road. Able to handle up to 6 million gallons per day, the WTF was built in 1963 to remove iron and manganese from the Lab's source water. Over the years, the facility has undergone a series of upgrades, most recently in 1995-96.

The step-by-step flow of water through the water-treatment process and the on-the-job performance of the WTF's certified staff are shown in the following photos taken by BNL photographer Roger Stoutenburgh. — Marsha Belford

STEP 6. Flocculation, or the formation of particle aggregates which settle out of the water as sediment, begins in the retention tank. To help form "floc," water is sent from the retention tank to a slow-mix tank. At the retention tank, Jack Kulesa (left) is checking for floc. — CN10-35-00

STEP 7. To remove all particles, filtration is performed using a rapid sand filter made up of sand and anthracite coal. Inspecting the valves in the filtration valve gallery are: (front to back) Richard Lutz, Phil Pizzo and Greg Stawski. — D2750306

STEP 8. The wet well stores filtered water before it is pumped into the air-stripping towers. In the wet-well pump room, Richard Lutz (front) works on a check valve, while Jack Kulesa inspects pump seals. — CN10-38-00

STEP 9. The air-stripping towers remove any volatile organic compounds (VOCs) from water undergoing treatment. Inspecting a tower is Joe Tullo. — D2840306

STEP 10. At the clear well, where up to 250,000 gallons of "finished" water is stored before its final chlorination and distribution, Richard Lutz and Jack Kulesa take samples. — CN10-146-00

STEP 11. The high-service pumps send finished water from the WTF to the two water towers on site. Greasing a pump bearing is Joe Tullo. — D2830306

STEP 12. Water from the Lab's two storage towers is delivered on site at 55 to 70 pounds of pressure per square inch via 45 miles of distribution pipe. Viewed from its base is the larger of the Lab's towers, which holds one million gallons of water. — CN10-44-00

STEP 13. Testing BNL water quality is Tom Boucher. Drinking water is sampled at different intervals in various locations, depending upon the test, and samples are analyzed by an independent, certified lab. Results are reported to the Suffolk County Department of Health Services and to BNL's Environmental & Waste Management Services Division, which ensures that the Lab's water complies with all applicable regulations. — CN10-41-00

Definition of Report Terms

- 90th percentile value: A percentile is a value on a scale of 100 that indicates the percent of a distribution that is equal to or below it. The 90th percentile is equal to or greater than 90 percent of the lead and copper values detected by your water system. The reported copper and lead values represent the 90th percentile.
- action level (AL): The concentration of a contaminant which, if exceeded, then triggers treatment and/or other requirements that a drinking-water supplier must follow.
- maximum contaminant level (MCL): The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to what is called the maximum contamination level goal (MCLG) as possible.
- maximum contamination level goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
- maximum residual disinfectant level (MRDL): the highest concentration of a disinfectant allowed in drinking water. Disinfectants have been proven to be necessary for controlling microbial contamination of water and eliminating water-borne illnesses.
- maximum residual disinfectant level goal (MRDLG): the concentration of a drinking-water disinfectant below which there is no known or expected risk to health.
- treatment technique: A required process intended to reduce the level of a contaminant in drinking water.
- micromhos per centimeter (umhos/cm): A measure of the ability of water to conduct electricity. Conductivity effectively measures the concentration of ions, such as dissolved salts.
- milligrams per liter (mg/l): Equals one part of liquid per million parts of liquid, or parts per million (ppm).
- millirem per year (mrem/yr): A measure of radiation absorbed by the body.
- micrograms per liter (µg/l): Equals one part of liquid per billion parts of liquid, or parts per billion (ppb).
- picocuries per liter (pCi/L): A measure of radioactivity in water.
- million fibers per liter (MFL): A measure of asbestos fibers longer than 10 micrometers.

BNL Water Quality Consumer Confidence Report

This annual special edition of the Bulletin is published by the Community, Education, Government & Public Affairs Directorate with the assistance of the Environmental & Waste Management Services (EWMS) Division and the Plant Engineering (PE) Division. It is distributed to the approximately 3,000 on-site drinking-water consumers served daily by federal public water system no. 5111891 at Brookhaven National Laboratory, Upton, New York 11973, which is owned by the U.S. Department of Energy and operated under contract by Brookhaven Science Associates, LLC.

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the Bulletin

BROOKHAVEN NATIONAL LABORATORY

2007 BNL Water Quality Consumer Confidence Report May 31, 2007

BNL's Drinking Water Complies With All Health, Safety Regulations

Last year, as in the past, Brookhaven Lab's drinking water and the supply system that produces it were in full compliance with all applicable county, state, and federal regulations regarding drinking-water quality, monitoring, operations, and reporting.

In fact, the Plant Engineering (PE) Division, which is responsible for the Lab's drinking-water supply system, is proud to report that BNL's water has never reached or exceeded what are called primary maximum contaminant levels (MCLs).

To ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (EPA) and the New York State Department of Health (NYSDOH) have prescribed regulations that limit the amounts of certain contaminants in water provided by public water systems, such as BNL's. Each drinking-water contaminant has an allowable MCL. Drinking water that exceeds MCLs for one or more compounds is in violation of the law.

To provide the same protection to those who drink bottled water, the U.S. Food & Drug Administration has established regulations to limit contaminants in bottled water.

Of the 113 drinking-water contaminants for which BNL tests its drinking water at the well, after treatment at the Water Treatment Facility, or at the consumers' tap, only 13 compounds were detected in the Lab's drinking water in 2006 (see tables on pages 2 and 3, and the discussion of those compounds on page 3).

Reducing 'Rusty' Water Around the Site

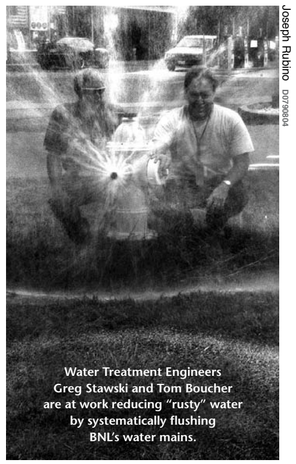
2007 Water-Main Flush Program Started

On May 7th, the water treatment engineers of BNL's Water Treatment Facility (WTF) began working their way around the site over a week to flush BNL's water mains. By systematically opening and closing fire hydrants from May 7th to 11th, they inaugurated BNL's 2007 water-main flushing program.

According to the American Water Works Association, unidirectional flushing of water mains using fire hydrants within a water-distribution system is the most effective and economical way to cleanse a water-distribution system and, thereby, improve water quality.

Performed three times a year, on-site water-main flushing will also take place in July and October. The hydrant-flushing schedule will be announced closer to the selected weeks via broadcast e-mail, a Bulletin notice, and a flyer, which will be distributed to on-site residents and posted on the Web.

Much of Long Island's groundwater is high in iron as a result of naturally occurring dissolved iron-containing minerals within the Upper Glacial aquifer. Water that enters BNL's distribution system, however, contains very low iron for one of two reasons: either because it comes from one of the three BNL drinking-water wells that produces water naturally low in iron, or because, if it comes from one of the three high-iron wells, the water is then treated in a multi-step process to remove iron at the Water Treatment Plant (see photo essay on page 4).



Joseph Rubino D0719804

Water Treatment Engineers Greg Stawski and Tom Boucher are at work reducing "rusty" water by systematically flushing BNL's water mains.

While being delivered around site via 45 miles of underground water mains, however, BNL water can and does pick up insoluble iron.

There are two sources of iron in BNL's water-distribution system: First, between 1941, when Camp Upton was reopened on the site during World War II, and 1963, when the WTF was commissioned, BNL did not treat its drinking water for iron; as a result, some 700 pounds of iron per year—or 7.7 tons over 22 years—was deposited. Second, the site has cast-iron and ductile iron water mains which add insoluble iron into the system as a result of oxidation.

Depending upon where a building is located along the water-distribution system, "rusty" water can be more or less of a problem. Because iron does not pose a health risk to most people at levels usually found in water, the EPA regulates it via secondary, or aesthetic, standards (see pages 2 and 3). — M.B.

Visit the WTF

Once you've looked at the pictures and read all about the Water Treatment Facility (WTF), why don't you come to see it for yourself—by going on a lunchtime tour for BNL employees, facility-users and other on-site guests.

Organized by Tour Program coordinator Elaine Lowenstein of the Community Relations Office, the WTF tour will take place on Friday, June 15th, from 12 noon to 1 p.m. Meet in the upper lobby of Berkner Hall by 12 noon sharp!

Bulletin Special Edition

2007 BNL Water Quality Consumer Confidence Report

This special edition of The Bulletin is Brookhaven National Laboratory's ninth annual Consumer Confidence Report. This report is published yearly for the BNL drinking-water consumer, to present an overview of water quality during the previous calendar year. Because the Lab is the on-site drinking-water supplier, BNL is required by the federal Safe Drinking Water Act (SDWA) of 1976, as amended in 1996, to produce an annual report on the quality of its drinking water.

In addition to reminding consumers of the importance and need to protect drinking-water sources, the report's purpose is to inform drinking-water consumers:

- where our water comes from
- what those tests reveal about the water
- what analytical tests are conducted
- how those results compare to state standards

Among its other responsibilities, BNL's Plant Engineering (PE) Division is committed to providing all employees, facility-users, guests, residents, and other visitors with safe drinking water while they are on site. To do so, PE operates BNL's drinking-water supply system, which is considered by the U.S. Environmental Protection Agency to be a "small community public water system" because it serves between 501 and 3,300 people. BNL's water supply system includes six wells dedicated to pumping drinking water and the Water Treatment Facility in Bldg. 624 (see photo essay on page 4).

To make sure that the Lab's drinking water meets all applicable local, state and federal water-quality standards, PE has BNL's drinking water regularly tested using an independent laboratory approved by the New York State Department of Health. To ensure that testing results comply with all applicable regulatory standards, analytical data are reviewed by the Lab's Environmental & Waste Management Services (EWMS) Division. In addition, PE and EWMS work with BNL's Environmental Restoration Projects to make sure that the Lab's potable-water supply is not impacted by groundwater contamination or remediation operations.

For more information and/or copies of the complete analyses of BNL's 2006 drinking-water samples discussed in this report, contact those listed below:

- Bill Chaloupka, PE Assistant Division Manager for Operations & Environment, Ext. 7136, chaloupka@bnl.gov
- Bob Lee, EWMS Deputy Division Manager for Environmental Programs, Ext. 3148, blee@bnl.gov
- Suffolk County Department of Health Services, (631) 853-2251

This report is also available at www.bnl.gov/bnlweb/pubaf/bulletin.html and www.bnl.gov/bnlweb/pubaf/water/reports.htm. — Marsha Belford

New Buildings' Drinking Water Subject to Quality Testing

Roger Stoutenburgh D0019497

Carlee Ogeka of the Environmental & Waste Management Services Division collects water samples from a faucet in the Research Support Building, Bldg. 400, while the building's manager, Joann Giambalvo of the Staff Services Division reviews the testing protocol.

Brookhaven Lab has two new buildings on the map — the Center for Functional Nanomaterials (CFN), which was dedicated this May 21st, and the Research Support Building, which opened October 27, 2006.

In addition to the necessities and amenities within each of these very different structures — one constructed for cutting-edge nanoscience research and another built in support of science and the facility-users who come to BNL — these buildings come complete with hot and cold running water.

To ensure that the cold water in the Lab's new buildings meets all applicable drinking-water quality standards established under the federal Safe Drinking Water Act, two sets of testing were completed in the RSB and are underway at the CFN. An independent, state-certified testing lab analyzed the RSB samples and will do the same for those from the CFN.

Water from RSB faucets passed all quality standards. When data from CFN faucet testing is available, it will be shared with the building manager and occupants.

The first set of drinking-water sampling and analyses is performed as part of the series of acceptance tests on building systems within in each structure, done before the facility is officially handed over to BNL from the contractor that constructed it.

A second set of cold-water testing is done by the Environmental & Waste Management Services Division, as part of its drinking-water quality-assurance program, to establish a benchmark at consumers' taps within the new buildings.

When the cold tap water meets quality standards at the tap, no bottled water is necessary. — Marsha Belford

What Is in Our Drinking Water?

Although rivers, lakes, streams, ponds, and reservoirs are all sources of tap and bottled drinking water, BNL and the rest of Long Island draw drinking water from groundwater wells that are drilled into the aquifer (see story below).

As water travels over land surfaces or through the ground, it dissolves naturally occurring minerals and radioactive material. In addition, water can pick up substances resulting from human activity or the presence of animals.

Contaminants that may be present in water include:

- microbial contaminants: bacteria and viruses, which may come from sewage, livestock operations, wildlife, etc.
- inorganic chemical contaminants: dissolved salts and metals, which can occur naturally or result from: storm-water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, farming, etc.
- pesticides & herbicides: substances for, respectively, eliminating problem insects and plants which may come from a variety of sources, such as agricultural operations, storm-water runoff, residential uses, etc.
- organic chemical contaminants: natural and synthetic compounds, including volatile organic compounds (VOCs). These chemicals are by-products of industrial processes and petroleum production, and they can also come from gas stations, storm-water runoff, septic systems, etc.
- radioactive contaminants: can be naturally-occurring, or from oil and gas production, mining activities, nuclear facilities, etc.

Because of the presence of contaminants, source water is often "finished," or treated to remove substances or reduce their concentration before that water is fit for human consumption (see photo essay on page 4).

Regardless, drinking water — including bottled water — may reasonably be expected to contain at least small amounts of contaminants. The presence of contaminants, however, does not necessarily indicate that the water poses a health risk (see story on page 3).

Some people may be more vulnerable to illness-causing microorganisms or pathogens in drinking water than others. People whose immune systems are compromised may be particularly at risk of infections. Those people include: cancer patients who are undergoing chemotherapy, people who have undergone organ transplants, persons with HIV/AIDS or other immune-system disorders, and some elderly people and infants. These people or their care-givers should seek advice from their health-care providers.

Guidelines from the U.S. Environmental Protection Agency (EPA) and the U.S. Centers for Disease Control on ways to reduce the risk of illness by cryptosporidium, giardia and other microbial pathogens are available from the EPA's Safe Drinking-Water Hotline, (800) 426-4791.

More information about drinking-water contaminants can be obtained from the EPA at www.epa.gov/safewater; or from the NYSDOH at www.health.state.ny.us.

2006 Analytical Data

Inorganic Chemicals, Bacteria, Radioactivity

The following values were measured in samples of well water or finished water at the Water Treatment Plant. The nine parameters noted in this table as detected in BNL water are discussed on page 3.

WATER-QUALITY INDICATORS

indicator	*BNL sample*	*MCL*
total coliform	ND	ND
color*	5 units	15 units
odor	0 units	3 units
chlorides*	31.4 mg/l	250 mg/l
sulfates*	10.4 mg/l	250 mg/l
nitrates*	0.43 mg/l	10 mg/l
nitrites	<MDL	1.0 mg/l
alkalinity†	54.4 mg/l	NS
ammonia	<MDL	NS
calcium†	8.6 mg/l	NS
conductivity†	270 µmhos/cm	NS
cyanide	<MDL	NS
methylene blue active substances	<MDL	NS
pH	6.0-9.5 standard units	NS

METALS

metal	*BNL sample*	*MCL*
antimony	<MDL	6.0 µg/l
arsenic	<MDL	50 µg/l
barium	<MDL	2.0 mg/l
beryllium	<MDL	4.0 µg/l
cadmium	<MDL	5.0 µg/l
chromium	<MDL	0.10 mg/l
fluoride	<MDL	2.2 mg/l
iron*	3.77 mg/l	0.3 mg/l
lead*	1.70 µg/l	15 µg/l
manganese*	0.13 mg/l	0.3 mg/l
mercury	<MDL	2.0 µg/l
nickel	<MDL	0.1 mg/l
selenium	<MDL	50 µg/l
silver	<MDL	100 µg/l
sodium*	17.5 mg/l	NS
thallium	<MDL	2.0 µg/l
zinc*	0.022 mg/l	5.0 mg/l

OTHER

parameter	*BNL sample*	*MCL*
asbestos	<MDL	7 MFL

RADIOACTIVITY

parameter	*BNL well max.*	*MCL*
gross alpha	<MDL	15 pCi/l
gross beta	<MDL	4 mrem/yr
tritium	<MDL	20,000 pCi/l
strontium-90	<MDL	8 pCi/l

<MDL: less than the minimum detection limit.
NS: drinking-water standard not specified.
ND: not detected.
† measure of water hardness or dissolved salts.
* Discussed in "2006: 13 Parameters Detected in BNL's Drinking Water," page 3.

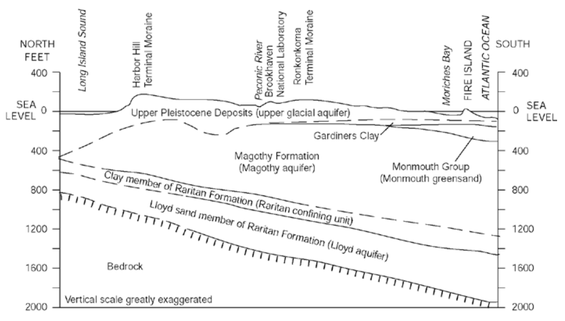
Long Island's 'Sole Source' Aquifer Is Brookhaven Lab's Water Source

All of the water supplied by BNL comes from beneath the ground and, hence, is referred to as groundwater. That water is stored beneath the ground in a sandy, geological formation known as an aquifer. Water in the aquifer originates as precipitation that percolates down through the soil, and this groundwater may be source water for natural springs or man-made wells.

The Long Island aquifer system is made up of three primary formations (see diagram below): From the surface to about 150 feet down is the Upper Glacial aquifer, from 150 to 1,000 feet is the Magothy, and from 1,000 to about 2,000 feet is the Lloyd. Drilled into the Upper Glacial, the Lab's six drinking-water wells draw up to 1,000 gallons per minute, or about 2.2 million gallons of water a day for use as drinking water, process cooling water, and fire protection. Last year, BNL pumped more than 500,000,000 gallons.

Long Island's aquifer system is one of 72 "sole source" aquifers in the nation recognized under the aquifer-protection program authorized by the U.S. Safe Drinking Water Act. Long Island's regional aquifer was so named on June 21, 1978, following a 1975 petition to the EPA by the Environmental Defense Fund.

— Marsha Belford



BNL's Source Water Assessed

As required by the 1996 amendments to the Safe Drinking Water Act, an assessment of the source water used by BNL's public water system was done by the New York State Department of Health (NYSDOH), as noted below. Based upon available hydrogeological, land use, and water-quality susceptibility information, the assessment of Brookhaven Lab's source water provides the Laboratory with additional information for use in protecting the source of BNL's drinking water.

As part of the assessment, known and possible contamination sources were evaluated. The assessment includes a susceptibility rating for each well, which is based on the risk posed by the presence of potential sources of contamination within the well's contributing area and the likelihood that the contaminants will travel through the environment to reach the well.

Although the susceptibility rating is an estimate of the potential for source-water contamination, it does not mean that the water delivered to consumers is or will become contaminated. If a contaminant is present, then it does not necessarily mean that there is a health risk. For a discussion of contaminants detected in 2005, see "2005: 13 Parameters Detected in BNL's Drinking Water" on page 3.

BNL's drinking water is pumped from six on-site wells (see story above and photo essay on page 4). According to the NYSDOH source-water assessment, two wells are rated as having a very high susceptibility to industrial solvents. This is primarily due to point sources of contamination along transportation routes and from previous spills within the source area. If industrial solvents were to impact water quality at the well, then this contamination would be removed by existing treatment facilities (carbon filters or air stripping; see photo essay on page 4) before the water is delivered to the consumer.

In addition, BNL has also identified that one well is susceptible to radionuclide contamination, specifically tritium. Although tritium has never been detected in this well, the Lab controls water-pumping operations to reduce the potential for impact. In addition to testing the supply-well water, BNL uses a network of groundwater-monitoring wells to track potential sources and contamination. If a supply well cannot provide water that meets drinking-water standards, then the Lab would immediately remove it from service.

A copy of the complete NYSDOH assessment may be reviewed by contacting either Doug Paquette, Ext. 7046, or Bob Lee, Ext. 3148.

2006 Analytical Data

Organic Compounds, Pesticides, Micro-Extractables

With two exceptions noted in the table below and discussed on page 3, the following compounds were not detected in source water from the Lab's six drinking-water wells or finished water at the Water Treatment Facility:

compounds	*BNL max.*	*MCL µg/l*
dichlorodifluoromethane	<MDL	5
chloromethane	<MDL	5
vinyl chloride	<MDL	2
bromomethane	<MDL	5
chloroethane	<MDL	5
fluorotrichloromethane	<MDL	5
1,1-dichloroethene	<MDL	5
methylene chloride	<MDL	5
trans-1,2-dichloroethene	<MDL	5
1,1-dichloroethane	<MDL	5
cis-1,2-dichloroethene	<MDL	5
2,2-dichloropropane	<MDL	5
bromochloromethane	<MDL	5
1,1,1-trichloroethane*	0.74	5
carbon tetrachloride	<MDL	5
1,1-dichloropropene	<MDL	5
1,2-dichloroethane	<MDL	5
trichloroethene	<MDL	5
1,2-dichloropropane	<MDL	5
dibromomethane	<MDL	5
trans-1,3-dichloropropene	<MDL	5
cis-1,3-dichloropropene	<MDL	5
1,1,2-trichloroethane	<MDL	5
total trihalomethanes*	12.9	80
1,1,2,2-tetrachloroethane	<MDL	5
1,3-dichloropropane	<MDL	5
chlorobenzene	<MDL	5
bromobenzene	<MDL	5
1,2,3-trichloropropane	<MDL	5
2-chlorotoluene	<MDL	5
4-chlorotoluene	<MDL	5
1,3-dichlorobenzene	<MDL	5
1,4-dichlorobenzene	<MDL	5
1,2-dichlorobenzene	<MDL	5
1,2,4-trichlorobenzene	<MDL	5
hexachlorobutadiene	<MDL	5
tetrachloroethene	<MDL	5
1,1,2,2-tetrachloroethane	<MDL	5
1,2,3-trichlorobenzene	<MDL	5
benzene	<MDL	5
toluene	<MDL	5
ethylbenzene	<MDL	5
m,p-xylene	<MDL	5
p-xylene	<MDL	5
o-xylene	<MDL	5
styrene	<MDL	5
isopropylbenzene	<MDL	5
n-propylbenzene	<MDL	5
1,3,5-trimethylbenzene	<MDL	5
tert-butylbenzene	<MDL	5
1,2,4-trimethylbenzene	<MDL	5
sec-butylbenzene	<MDL	5
4-isopropyltoluene	<MDL	5
n-butylbenzene	<MDL	5
methyl tertiary butyl ether	<MDL	50
lindane	<MDL	0.2
heptachlor	<MDL	0.4
aldrin	<MDL	5
heptachlor epoxide	<MDL	0.2
dieldrin	<MDL	5
endrin	<MDL	0.2
methoxychlor	<MDL	40
toxaphene	<MDL	3
chlordane	<MDL	2
polychlorinated biphenyls (PCBs)	<MDL	0.5
2,4,5-TP (silvex)	<MDL	10
dinoseb	<MDL	50
dalapon	<MDL	50
pichloram	<MDL	50
dicamba	<MDL	50
pentachlorophenol	<MDL	1
hexachlorocyclopentadiene	<MDL	5
di(2-ethylhexyl)phthalate	<MDL	50
di(2-ethylhexyl)adipate	<MDL	50
hexachlorobenzene	<MDL	5
benzo(A)pyrene	<MDL	50
aldicarb sulfone	<MDL	NS
aldicarb sulfoxide	<MDL	NS
aldicarb	<MDL	NS
oxamyl	<MDL	50
3-hydroxycarbofuran	<MDL	50
carbofuran	<MDL	40
carbaryl	<MDL	50
methomyl	<MDL	50
glyphosate	<MDL	50
diquat	<MDL	50
ethylene dibromide	<MDL	0.05
1,2-dibromo-3-chloropropane	<MDL	0.2
2,4-D	<MDL	50
alachlor	<MDL	2
simazine	<MDL	50
atrazine	<MDL	3
metolachlor	<MDL	50
metribuzin	<MDL	50
butachlor	<MDL	50
propachlor	<MDL	50

<MDL: less than the minimum detection limit.
NS: drinking-water standard not specified.
* discussed in "2006: 13 Parameters Detected in BNL's Drinking Water," page 3.

2006: 13 Parameters Detected in BNL's Drinking Water

As marked with an asterisk in the analytical data on page 2 and below, the 13 parameters discussed below were detected in BNL's drinking water.

According to the U.S. Environmental Protection Agency, it is reasonable to expect that drinking water—including bottled water—may contain at least small amounts of some contaminants. The presence of contaminants, however, does not necessarily indicate that the water poses a health risk (see story, page 2).

The 13 parameters detected in BNL drinking water were found at concentrations well below what are called the maximum contaminant level (MCL; see term definitions on page 4). Thus no violations of the federal Safe Drinking Water Act, as amended, or any other applicable government regulation occurred.

For more information on these contaminants, go to EPA's Web site: www.epa.gov/safewater/hfacts.html.

WATER-QUALITY INDICATORS

• COLOR

MCLG: none **BNL max.:** 5 units **detected:** 06/15/06, wells 6 & 7
MCL: 15 units **BNL range:** <5-5 units **violation?:** No

- **major sources in drinking water:** Natural presence of metals such as copper, iron and manganese.
- **possible health effects:** Water color has no health effects. When color is present at levels as low as 5 units, some people may find the color aesthetically displeasing and objectionable.

INORGANIC CONTAMINANTS

• CHLORIDES

MCLG: none **BNL max.:** 31.4 mg/l **detected:** 01/06/06, Bldg. 185
MCL: 250 mg/l **BNL range:** 15.4-31.4 mg/l **violation?:** No

- **major sources in drinking water:** Naturally occurring or indicative of road-salt contamination.
- **possible health effects:** No health effects. The MCL for chloride is the level above which the taste of water may become objectionable. In addition to the adverse taste effects, high chloride concentrations in water contribute to the deterioration of domestic plumbing and water heaters. Elevated chloride concentrations may also be associated with sodium in drinking water.

• COPPER*

MCLG: 1.3 mg/l **AL at 90th percentile:** 1.3 mg/l **BNL range:** <0.02-0.46 mg/l
 # samples exceeding AL: 0 of 20 **BNL value at 90th percentile:** 0.23 mg/l
detected: 08/04/06, Bldg. 703 **violation?:** No

- **major sources in drinking water:** Corrosion of household plumbing.
- **possible health effects:** Copper is an essential nutrient, required by the body in very small amounts. When people drink water containing copper above the action level over a short time, some could experience gastrointestinal distress, such as nausea and vomiting. Some people who drink water containing copper in excess of the action level over many years could suffer liver or kidney damage. People with Wilson's disease may be more sensitive than others to the effects of copper, so they are advised to consult their health-care provider.

** **note:** These are the latest results from sampling at the consumers' tap, which last took place in 2006. Sampling will again take place in 2009; those results will be reported in 2010.*

• IRON

MCLG: none **BNL max.:** 3.77 mg/l **detected:** 06/15/06, well #6
MCL: 0.3 mg/l **BNL range:** <0.02-3.77 mg/l **violation?:** No

- **major sources in drinking water:** Naturally occurring.
- **possible health effects:** Iron usually has no health effects. When iron reaches 1 mg/l, a substantial number of people will notice the bitter, astringent taste of iron. At this concentration, it also imparts a brownish color to laundered clothing and stains plumbing fixtures with a characteristic brown color. Therefore, the MCL of 0.3 mg/l represents a reasonable compromise, as, at this level, adverse aesthetic effects are minimized. Many multivitamins contain 3,000-4,000 mg of iron per capsule. Color in BNL water is due to iron. All treated water, however, meets the MCL at the WTF.

• LEAD*

LEAD AT THE WELL

MCLG: 0 µg/l **BNL max.:** 1.70 µg/l **detected:** 06/15/06, well #12
MCL: 15 µg/l **BNL range:** <1.0-1.70 µg/l **violation?:** No

LEAD AT CONSUMERS' TAP*

MCLG: 0 µg/l **AL at 90th percentile:** 15 µg/l **BNL range:** <1.0-28.7 µg/l
 # samples exceeding AL: 1 of 20 **BNL value at 90th percentile:** 11.4 µg/l
detected: 08/04/06, Apt. 1A **violation?:** No

- **major sources in drinking water:** Corrosion of household plumbing, typically plumbing in older buildings.
- **possible health effects:** Children and pregnant women are most susceptible to the health risks of lead. Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight defects in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.

** **note:** These are the latest results from sampling at the consumers' tap which last took place in 2006. Sampling will again take place in 2009; those results will be reported in 2007.*

• MANGANESE

MCLG: none **BNL max.:** 0.130 mg/l **detected:** 06/03/06, Bldg.185
MCL: 0.3 mg/l **BNL range:** <0.010-0.130 mg/l **violation?:** No

- **major sources in drinking water:** Naturally occurring; indicative of landfill contamination.
- **possible health effects:** The National Research Council has determined that an estimated safe and adequate daily dietary intake of manganese is 20-50 mg for adults. Many people, however, consume even higher amounts of manganese, especially those who consume large amounts of vegetables. Since drinking water contains iron and manganese, it is better if it is not used to make infant formula. Excess manganese produces a brownish color in laundered goods, and it affects the taste of tea, coffee and other beverages. High concentrations may cause a dark brown or black stain on porcelain plumbing fixtures. As does iron, manganese may form a coating on distribution pipes which may slough off, causing black particles in the water and/or brown blotches on laundry.

• NITRATES

MCLG: 10 mg/l **BNL max.:** 0.43 mg/l **detected:** 06/15/06, well #12
MCL: 10 mg/l **BNL range:** 0.20-0.43 mg/l **violation?:** No

- **major sources in drinking water:** Runoff from fertilizer use; leaching from septic tanks, and/or sewage; erosion of natural deposits.
- **possible health effects:** Excessive levels of nitrate in water have caused serious illness and sometimes death. Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blueness of the skin, known as blue-baby syndrome.

• SODIUM

MCLG: none **BNL max.:** 17.5 mg/l **detected:** 01/06/06, Bldg. 185
MCL: none **BNL range:** 10.0-17.5 mg/l **violation?:** No

- **major sources in drinking water:** Naturally occurring, or due to road salt, water softeners, and/or animal waste.
- **possible health effects:** Water containing more than 20 mg/l of sodium should not be used for drinking by people on severely restricted sodium diets. Water containing more than 270 mg/l of sodium should not be used for drinking by people on moderately restricted sodium diets.

• SULFATE

MCLG: none **BNL max.:** 10.4 mg/l **detected:** 06/15/06, well #7
MCL: 250 mg/l **BNL range:** 6.2-10.4 mg/l **violation?:** No

- **major sources in drinking water:** Naturally occurring.
- **possible health effects:** High sulfate concentrations in drinking water can have three effects: first, water containing appreciable amounts of sulfates tends to form hard scale in boilers and heat exchangers; second, sulfates affect the taste of water; and, third, sulfates can act as a laxative if intake is excessive. Sulfates' laxative effect is usually observed in transient users of a water supply, as people who are accustomed to high sulfate level do not respond adversely. Diarrhea may result from sulfate levels greater than 500 mg/l, but, typically, from levels closer to 750 mg/l.

• ZINC

MCLG: none **BNL max.:** 0.022 mg/l **detected:** 01/06/06, Bldg. 185
MCL: 5 mg/l **BNL range:** <0.02-0.022 mg/l **violation?:** No

- **major sources in drinking water:** Naturally occurring, or due to mining waste or corrosion of household plumbing.
- **possible health effects:** Zinc has no health effects unless detected in very high concentrations. The presence of zinc may result in an undesirable taste in drinking water.

VOLATILE ORGANIC CONTAMINANT

• 1,1,1-TRICHLOROETHANE

MCLG: none **BNL max.:** 0.74 µg/l **detected:** 04/07/06, well #12
MCL: 5 µg/l **BNL range:** <0.5-0.74 µg/l **violation?:** No

- **major sources in drinking water:** Discharge from metal degreasing sites, factories and other industrial facilities.
- **possible health effects:** Some people who drink water containing 1,1,1-trichloroethane in excess of the MCL for a short period of time or over many years may experience damage to their liver, nervous system and/or circulatory system.

• TOTAL TRIHALOMETHANES

TOTAL TRIHALOMETHANES AT THE WELL OR IN WTF EFFLUENT

MCLG: none **BNL max.:** 12.9 µg/l **detected:** 10/06/06, well #6
MCL: 80 µg/l **BNL range:** <0.5-12.9 µg/l **violation?:** No

TOTAL TRIHALOMETHANES AT CONSUMERS' TAP

MCLG: none **BNL annual value:** 13.0 µg/l **detected:** 09/08/06, Bldg. 363
MCL: 80 µg/l **violation?:** No

- **major sources in drinking water:** By-product of water chlorination, which is performed to kill harmful organisms. Trihalomethanes are formed when source water contains large amounts of organic matter. Total trihalomethanes is the sum of chloroform, bromodichloromethane, dibromochloromethane and bromoform.
- **possible health effects:** Some people who drink water containing trihalomethanes in excess of the MCL over many years may experience liver, kidney or central nervous system problems, and they may have an increased risk of getting cancer.

DISINFECTANT

• CHLORINE RESIDUAL

MCLG: none **BNL annual average:** 0.6 mg/l **detected:** 10/06/06, Bldg. 640
MCL: 4 mg/l **BNL range:** 0.3-1.4 mg/l **violation?:** No

- **major sources in drinking water:** By-product of drinking-water chlorination.
- **possible health effects:** Some people who use drinking water containing chlorine in excess of the MCL could experience eye or nose irritation. Some people who drink water containing chlorine in excess of the MCL could experience stomach discomfort.

2006 Analytical Data

Lead and Copper Tap Samples

In the U.S. today, the use of lead in plumbing pipes, fixtures, fittings, and solder has been restricted by law since the 1986, when the Safe Drinking Water Act was amended to require a rule regulating lead and copper in drinking water.

These metals enter drinking water mainly as a result of the corrosion of plumbing materials and may pose health risks. So, in restricting the amount of lead and copper, the rule aims to protect public health by having public water suppliers reduce water corrosivity.

Under this rule, BNL is required to sample water for lead and copper every three years at a number of representative taps agreed upon by the New York State Department of Health Services.

Below are the latest results from that sampling, which took place in 2006. Sampling will again take place in 2009; those results will be reported in 2010.

LEAD AT CONSUMERS' TAP*

MCLG: 0 µg/l **BNL range:** <1.0 to 28.7 µg/l
AL at the 90th percentile: 15 µg/l
BNL 90th percentile value: 11.4 µg/l
date: 08/04/06 **violation?** No

COPPER AT CONSUMERS' TAP*

MCLG: 1.3 mg/l **BNL range:** <0.02 to 0.46 mg/l
AL at the 90th percentile: 1.3 mg/l
BNL 90th percentile value: 0.23 mg/l
date: 08/04/06 **violation?** No

* Discussed in "2006: 13 Parameters Detected in BNL's Drinking Water," above.

2006 Analytical Data

Disinfectant and By-Products

Daily, more than 200 million people in the U.S. consume water that has been disinfected to kill unwanted microorganisms found in source water. Worldwide, one of the most commonly used and effective disinfectants is chlorine. BNL uses a form of chlorine called sodium hypochlorite for water disinfection.

Although disinfectants are effective, they can react with naturally occurring organic matter and inorganics to form what are called disinfectant by-products, which may pose health risks. As a result, the Safe Drinking Water Act was amended in 1996 to regulate disinfectants and their by-products. So, since January 2004, BNL has been complying with the first of those rules, which regulates chlorine and its by-products. The following 2006 averages are based on results from finished water from the tap:

disinfectant residual	2006 BNL running average	MRDLG
chlorine*	0.6 mg/l	4 mg/l
disinfection by-products	**2006 BNL annual average**	**MCL**
total trihalomethanes[1]	13 µg/l	80 µg/l
haloacetic acids (five)[2]	<2.0 µg/l	60 µg/l

* Discussed in "2006: 13 Parameters Detected in BNL's Drinking Water," above.
[1] Total trihalomethanes are the sum of the concentrations of chloroform, bromodichloromethane, dibromochloromethane, and bromoform.
[2] Haloacetic acids (five) is the sum of the concentration of mono-, di- and trichloroacetic acids, and mono- and dibromoacetic acids.