



WATER QUALITY AND COMPLIANCE

Findings and Recommendations

WHAT'S ON TAP?

Grading Drinking Water in U.S. Cities

June 2003

WATER QUALITY AND COMPLIANCE

City	2001 Grade
Albuquerque	Poor
Atlanta	Fair
Baltimore	Good
Boston	Poor
Chicago	Excellent
Denver	Good
Detroit	Good
Fresno	Poor
Houston	Fair
Los Angeles	Fair
Manchester	Good
New Orleans	Good
Newark	Fair
Philadelphia	Fair
Phoenix	Poor
San Diego	Fair
San Francisco	Poor
Seattle	Fair
Washington, D.C.	Fair

To evaluate water quality and compliance, NRDC reviewed tap water quality data, Environmental Protection Agency (EPA) compliance records, and water suppliers' annual reports. Our research revealed a wide range of tap water quality throughout the 19 cities surveyed—from excellent drinking water in Chicago to poor tap water in Albuquerque, Fresno, Phoenix, and San Francisco.

FINDINGS

NRDC found that healthy city water supplies resemble each other and succeed in three discrete areas: source water protection, treatment, and maintenance and operation of the system.

Every problem water supply, however, is unhealthy in its own way: it may fail in just one of the three discrete areas mentioned above, or it may have a combination of factors that contribute to the system's ailments. Fresno, for example, has no source water protection; Albuquerque and San Francisco do not have adequate treatment systems in place; Atlanta has a poor maintenance and distribution system. Phoenix has a unique set of problems in addition to its long-standing woes: the city repeatedly failed to comply with basic water safety monitoring and reporting requirements. As a result, we don't even know what contaminants are in Phoenix's water—and this uncertainty may have health implications for people who live there.

A HANDFUL OF CONTAMINANTS FOUND IN MOST CITIES

We also observed that while tap water can contain a vast array of contaminants, a handful of particularly harmful contaminants surfaced repeatedly in our study. For example:

- ▶ **lead**, which enters drinking water supplies from the corrosion of pipes or faucets, can cause permanent brain damage and decreased intelligence in infants and children;
- ▶ **pathogens** (germs) such as *Cryptosporidium*, a microscopic disease-carrying protozoan that presents health concerns, especially to individuals with weakened immune systems, including HIV/AIDS patients, the frail elderly, children, and people

who have undergone organ transplants or cancer chemotherapy or have certain chronic diseases;

- ▶ by-products of the chlorination process such as **trihalomethanes** and **haloacetic acids** may cause cancer, and, potentially, reproductive problems and miscarriage.
- ▶ several other **carcinogens** or otherwise **toxic contaminants** also appeared in water supplies, including arsenic (from mining and industrial processes or natural processes), naturally occurring radioactive radon, the pesticide atrazine (affecting the water of more than 1 million Americans), and the rocket fuel **perchlorate** (present in the water supplies of more than 10 million Americans).

FEW VIOLATIONS, GENERALLY LOW STANDARDS

Overall, NRDC's study revealed a relatively small number of cities in outright violation of national standards. This fact does not imply low contaminant levels, but rather weak standards: in short, the EPA has written most standards in a way that most cities will not be in violation. For example, recent studies show that there is no safe level of cancer-causing arsenic in drinking water. Nonetheless, today's standard, in place since 1942, is 50 parts per billion (ppb). The EPA recently set a new standard at 10 ppb, which will go into effect in 2006. The EPA found that 3 ppb was a feasible standard, but the agency set the standard at 10 ppb because of concerns about treatment costs to water utilities. The National Academy of Sciences has found that at the 10 ppb EPA standard, the lifetime fatal cancer risk is about 1 in 333—more than 30 times higher than what the EPA says is usually the highest acceptable risk. Nonetheless, arsenic is still present in the drinking water of 22 million Americans, hovering at average levels of 5 ppb—half the new national standard and just one-tenth of the current national standard.

Many cities evaluated by NRDC failed to meet an EPA action level or exceeded a new (not-yet-enforceable) EPA standard. Among the cities with such problems were:

Albuquerque

- ▶ exceeded new national standard for arsenic (effective in 2006)
- ▶ exceeded proposed national standard for radon

Boston

- ▶ exceeded national action level for lead
- ▶ was sued by the EPA for allegedly violating the surface water treatment rule (which mandates that the supplier filter or adequately protect the watershed; the court ruled that the violation was not sufficient to force filtration)

Fresno

- ▶ apparently violated the nitrate standard (the wells in question were later taken out of service)
- ▶ seriously contaminated with numerous pesticides and industrial contaminants (EDB; PCE; TCE; DBCP; 1,1-dichloromethane; and cis-1,2-dichloroethylene)
- ▶ radon reported at levels in excess of proposed national standard

Houston

- ▶ exceeded new national standard (effective in 2002) for haloacetic acids but improved level in 2001 to below new standard
- ▶ apparently exceeded proposed standard for radon

Los Angeles

- ▶ exceeded proposed standard for radon in 2000

Newark

- ▶ exceeded action level for lead

Phoenix

- ▶ repeatedly violated MCLs as well as testing and reporting requirements, prompting an enforcement case

San Francisco

- ▶ exceeded new national standard (effective in 2002) for trihalomethanes but obtained extension of national compliance deadline

Seattle

- ▶ exceeded action level for lead
- ▶ exceeded new national standard for haloacetic acids in 2001 (levels dropped in 2002)
- ▶ exceeded one criterion for avoiding filtration
- ▶ indicated the presence of *Cryptosporidium*

MORE SPIKES, INDICATING POOR INFRASTRUCTURE

Finally, NRDC's study revealed an increase in the frequency of periodic spikes in contamination in many cities, indicating that aging equipment and infrastructure may be inadequate to handle today's contaminant loads or spills. On occasion, these risks were substantial. For example, in Washington, D.C., levels of trihalomethanes—which potentially cause cancer, birth defects, and miscarriages—peaked at more than double the EPA standard. (It is noteworthy that while Washington, D.C., recently changed its treatment to mitigate such spikes, many other cities continue to suffer from them.) With most EPA chemical standards (such as arsenic, haloacetic acids, and trihalomethanes), a spike above the EPA standard does not trigger a violation; only an average level over the standard is considered a violation. In recent years, Atlanta, Baltimore, and Washington, D.C., issued boil-water alerts as a result of turbidity peaks or other problems. While aggressive action in each city significantly lowered those levels, spikes in contaminants may pose immediate health problems to particularly susceptible people. Spikes of contaminants at levels above EPA standards included:

Atlanta spikes: turbidity, localized boil-water alerts from main breaks, haloacetic acids

Baltimore spikes: turbidity triggering citywide boil-water alert, trihalomethanes, haloacetic acids, lead

Boston spikes: trihalomethanes and haloacetic acids

Houston spikes: arsenic, radon, trihalomethanes

Los Angeles spikes: arsenic, lead, nitrates, perchlorate, trihalomethanes, haloacetic acid, radon

Manchester spikes: lead

New Orleans spikes: atrazine, turbidity

Newark spikes: haloacetic acids, trihalomethanes

Philadelphia spikes: haloacetic acids, total trihalomethanes, lead

Phoenix spikes: arsenic, di(2-ethylhexyl)phthalate (DEHP), haloacetic acids, nitrates, trihalomethanes, perchlorate

Seattle spikes: lead, turbidity, *Cryptosporidium*, haloacetic acids, trihalomethanes

Washington, D.C., spikes: coliform, cyanide, trihalomethanes, haloacetic acids, turbidity, lead

SUMMARIES FOR 2001 DATA

Albuquerque: Poor

- ▶ violated proposed standard for radon (though may qualify for a waiver)
- ▶ violated new standard (effective in 2006) for arsenic, reporting the highest levels of the contaminant found in this study. The findings present a cancer risk 40 times higher than ordinarily accepted by the EPA
- ▶ exceeded national health goals for many contaminants of concern, including gross alpha radiation, thallium, total coliform, fecal coliform/*E. coli*, total trihalomethanes, and haloacetic acids

Atlanta: Fair

- ▶ violated turbidity standard; utility reported there was no health risk
- ▶ experienced main breaks and several boil-water alerts
- ▶ reported significant levels of haloacetic acids and lead
- ▶ revealed poor pipe maintenance in the distribution system, resulting in widespread breaks and outages throughout the city

Baltimore: Good

- ▶ violated turbidity standard in 2000 but improved levels by 2001
- ▶ reported significant levels of lead and haloacetic acids
- ▶ reported spikes in total trihalomethanes

Boston: Poor

- ▶ failed to meet national action level for lead
- ▶ reported significant levels of trihalomethanes, which spiked above the national standard; no violation recorded because the EPA's standard is based on average levels
- ▶ sued by the EPA for allegedly not meeting Surface Water Treatment Rule require-

ment for filtration or watershed protection (court ruled violation wasn't sufficient to trigger filtration mandate)

- ▶ *Cryptosporidium* in source water
- ▶ reported continuing problems with an uncovered reservoir that may allow pathogens in the water supply

Chicago: Excellent

- ▶ tap water quality was the best in study
- ▶ reported low levels of lead, trihalomethanes, and haloacetic acids

Denver: Good

- ▶ reported moderate levels of haloacetic acids and total trihalomethanes
- ▶ reported significant levels of lead

Detroit: Good

- ▶ reported significant levels of total trihalomethanes, haloacetic acids, total coliform, and lead

Fresno: Poor

- ▶ reported significant levels of nitrates, sometimes in apparent violation
- ▶ reported significant levels of pesticides and industrial chemicals, including
 - ▶ 1,1-dichloromethane
 - ▶ cis-1,2-dichloroethylene
 - ▶ ethylene dibromide
 - ▶ trichloroethylene
 - ▶ perchloroethylene
 - ▶ dibromochloropropane
- ▶ reported significant levels of lead
- ▶ reported significant levels of gross alpha radiation
- ▶ reported significant levels of radon
- ▶ reported significant levels of arsenic

Houston: Fair

- ▶ wells violated proposed radon standards, which were the highest reported in this study
 - ▶ wells supply around 35 percent of the city's water
 - ▶ radon levels spiked to twice the national standard
 - ▶ the city may eventually qualify for a waiver of that standard
- ▶ in 2000, exceeded national standard for haloacetic acids, with the highest levels reported in this study; levels improved in 2001
- ▶ reported significant levels of trihalomethanes
- ▶ reported significant levels of arsenic, measuring higher than most cities
- ▶ reported significant levels of coliform
- ▶ violated monitoring standards

Los Angeles: Fair

- ▶ violated national draft safety level for perchlorate
- ▶ reported significant levels of total trihalomethanes and haloacetic acids
- ▶ reported substantial levels of arsenic
- ▶ reported elevated levels of radioactive and cancer-causing radon in some wells
- ▶ reported significant levels of nitrates in some wells
- ▶ reported problems with uncovered finished water reservoirs

Manchester: Good

- ▶ reported low levels of methyl tertiary-butyl ether (MTBE) in water supply, apparently from gasoline as a result of recreational boating in source waters
- ▶ reported significant levels of lead
- ▶ reported significant levels of trihalomethanes
- ▶ reported low levels of trichloroethylene

New Orleans: Good

- ▶ reported significant levels of trihalomethanes and haloacetic acids
- ▶ reported a significant peak in turbidity
- ▶ reported moderate levels of the pesticide atrazine

Newark: Fair

- ▶ exceeded national action level for lead
- ▶ reported significant levels of total trihalomethanes and haloacetic acids, measuring half the national standard
- ▶ reported problems with reservoirs, including an uncovered finished water reservoir

Philadelphia: Fair

- ▶ reported significant levels of trihalomethanes and haloacetic acids, approaching the national standard
- ▶ reported significant levels of lead, at around two-thirds of the action level
- ▶ reported significant activity in the watershed, including substantial levels of *Cryptosporidium* and *Giardia* in raw water
- ▶ medical researchers suggested recent past waterborne disease may have been associated with turbidity spikes
- ▶ reported generally low levels of a variety of industrial chemicals, metals, and pesticides

Phoenix: Poor

- ▶ reported repeated violations of monitoring and reporting requirements
- ▶ reported relatively high levels of arsenic
- ▶ exceeded draft national safe level for perchlorate
- ▶ reported significant spikes (above new standards) of trihalomethanes and haloacetic acids
- ▶ reported significant levels of nitrates, approaching national standard

- ▶ reported significant levels of chromium and di(2-ethylhexyl)phthalate (DEHP)
- ▶ settled an EPA enforcement action in 2000, which alleged numerous past MCL, monitoring, and reporting violations

San Diego: Fair

- ▶ exceeded draft national safe level for perchlorate
- ▶ reported significant levels of trihalomethanes and haloacetic acids
- ▶ reported significant levels of ethylene dibromide
- ▶ reported significant levels of lead
- ▶ reported significant levels of total coliform bacteria
- ▶ reported significant levels of radioactive contaminants, including gross alpha radiation, gross beta radiation, uranium, and low levels of MTBE

San Francisco: Poor

- ▶ violated the new standard for total trihalomethanes but received an extension on the deadline
- ▶ reported presence of *Cryptosporidium* and *Giardia*
- ▶ reported significant levels of lead
- ▶ reported significant cross-connection risk in separate potable and nonpotable supply systems

Seattle: Fair

- ▶ exceeded national action level for lead
- ▶ confirmed *Cryptosporidium*
- ▶ reported significant levels of haloacetic acids and total trihalomethanes in 2000, which improved in 2001
- ▶ reported significant turbidity spikes

Washington, D.C.: Fair

- ▶ violated new national standard for trihalomethanes in 2000; levels reduced in 2001
- ▶ reported significant spike of cyanide, the highest reported in this study
- ▶ reported significant levels of haloacetic acids
- ▶ reported significant levels of total coliform
- ▶ reported moderate levels of radioactive contaminants

RECOMMENDATIONS

NRDC makes four major recommendations to improve water quality and compliance.

First, NRDC recommends that this country invest in infrastructure to upgrade deteriorating water systems and modernize treatment techniques. Modernizing infrastructure is a costly but necessary task. New Orleans's system, for example, needs at least \$1 billion in repairs and improvements, according to city officials;

Washington, D.C., is implementing a \$1.6 billion capital improvement plan to improve city water and wastewater.^{1,2}

Credible estimate for upgrades and repairs that would ensure, for years to come, the safety of drinking water nationwide place the tab at around \$500 billion.³ In May 2002, the Congressional Budget Office came to a similar conclusion: \$232 to \$402 billion in investments will be needed over the next two decades to upgrade and repair the nation's drinking water systems.⁴ Specifically, NRDC recommends that:

- ▶ legislators appropriate substantial additional federal, state, and local funds to help America's neglected city drinking water systems shoulder \$500 billion in water infrastructure needs nationwide
- ▶ Congress enact and fund water infrastructure legislation that at least doubles current federal support for drinking water supplies from the current level of \$1.7 billion per year. A portion of this funding should be earmarked for source water protection and other cost-effective green infrastructure projects
- ▶ states and local governments consider raising money through bond issues and other financing mechanisms in order to fund investment
- ▶ Congress enact municipal bond reform legislation to make bonds a more efficient and attractive means to support water infrastructure projects
- ▶ water systems increase rates, which will allow them to collect sufficient funds—with support from state and federal government funding—to rehabilitate, upgrade, and fully maintain their water supply infrastructure for the long haul
- ▶ water systems adopt long-term operation and maintenance planning, and capital improvement plans, to assure that old pipes and infrastructure will be replaced and rehabilitated before the problems become crises
- ▶ Congress and water systems adopt low-income assistance programs

Second, NRDC recommends that investment be earmarked not just for old pipes but also for upgrading drinking water treatment. Most major U.S. cities still employ the same basic water treatment technologies that have been used since before World War I—techniques that cannot remove many human-made (or human-released) chemicals that modern science, industry, mining, and manufacturing have created.⁵ With today's technology, four state-of-the-art advanced treatment techniques are available and used in Europe and elsewhere in the world but are rarely used alone in this country and virtually never together:

- ▶ ozone
- ▶ granulated activated carbon
- ▶ ultraviolet (UV) light treatment
- ▶ membrane treatment (such as reverse osmosis or nanofiltration)

Advanced treatment is most effective. For example, a Seattle plant uses ozone and UV treatment to kill *Cryptosporidium*, and in Manchester, the use of granular activated carbon has reduced levels of synthetic organic chemicals including trihalomethanes. A few cities are using membrane treatment to reduce salt levels or to get rid of contaminants that are difficult to treat.

How NRDC Arrived at the Water Quality and Compliance Grades for 2001

The More Checks, the Better the Grade. See page 75 for Methodology

City	2001 Grade	No violation of currently enforceable national standards	No exceedance of action levels	No violations of proposed or final (but not yet enforceable) standards	All detected contaminants with national health goals of 0 are found at less than 25% of national standard	Some detected contaminants with national health goals of 0 are found at less than 25% of national standard	No repeated water quality problems or compliance problems	Additional comments
Albuquerque	Poor	✓	✓	✓	✓	✓	✓	Highest arsenic in study
Atlanta orders	Fair		✓	✓				Multiple boil-water
Baltimore	Good	✓	✓	✓	✓	✓	✓	Citywide boil-water order (2000)
Boston	Poor			✓		✓		Issues with lead; uncovered reservoirs; filtration avoidance
Chicago	Excellent	✓	✓	✓	✓	✓	✓	Best water in study
Denver	Good	✓	✓	✓	✓	✓	✓	Moderate TTHM, lead
Detroit	Good	✓	✓	✓	✓	✓	✓	Moderate TTHM, HAA, coliform, lead
Fresno	Poor							Worst water in study
Houston	Fair	✓	✓					Radon exceeded proposed standard
Los Angeles	Fair	✓	✓			✓		Issues with uncovered reservoirs; radon (2000); perchlorate
Manchester	Good	✓	✓	✓		✓	✓	Lead, MTBE
New Orleans	Good	✓	✓	✓		✓	✓	TTHM, HAA, turbidity, atrazine
Newark	Fair	✓		✓		✓	✓	Lead exceeded action level; issues with reservoir problems; TTHM, HAA
Philadelphia	Fair	✓	✓	✓		✓		Lead, TTHM, HAA; spills; medical articles—possible disease
Phoenix	Poor		✓			✓		Many monitoring, reporting violations; perchlorate, nitrates, coliform, TTHMs
San Diego	Fair	✓	✓	✓		✓	✓	TTHM, HAA, lead, perchlorate
San Francisco	Poor		✓			✓	✓	Exceeded TTHM standard; lead; cross-contamination risk
Seattle	Fair	✓				✓		Lead exceeded action level; HAAs exceeded standard (2000, fixed '01); TTHM; turbidity; filtration avoidance issue
Washington, D.C.	Fair	✓	✓	✓		✓	✓	TTHM, HAA, coliform, cyanide

ABBREVIATIONS: TTHM=Total Trihalomethanes; HAA: Haloacetic Acids; MTBE: methyl tert-butyl ether

Based upon our findings, NRDC recommends that cities invest in protecting and improving the quality of tap water as follows. Regarding infrastructure, we recommend that water systems:

- ▶ shift to ozone and/or UV light as primary disinfectants, which eliminate *Cryptosporidium* and other pathogens unharmed by chlorine and reduce levels of chlorination by-products, such as trihalomethanes and haloacetic acids
- ▶ also use granulated activated carbon to further reduce the levels of disinfection by-products and other synthetic organic chemicals such as pesticides and industrial chemicals
- ▶ seriously consider upgrading to membrane treatment, since it can eliminate virtually all contaminants; investment in membranes now will avoid the need to constantly change treatment approaches as more and more contaminants are identified as health threats and EPA or states regulate them

Regarding infrastructure, we recommend that the EPA:

- ▶ encourage upgrades to advanced treatment technologies
- ▶ invest in research and development to improve current technologies and to bring down costs
- ▶ develop incentives for water systems to adopt advanced treatment such as membranes to eliminate most contaminants from tap water

Third, water suppliers, states, the EPA, and Congress must increase source water protection efforts. The first line of defense to protect drinking water safety is to ensure that source water—lakes, rivers, or groundwater—is protected from pollution. This requires aggressive efforts on the part of water utilities and state officials to identify pollution sources and to take regulatory or other actions to address them. The EPA needs to take a leadership role in issuing strong regulations to address major, poorly controlled pollution sources, including:

- ▶ concentrated animal feeding operations, which contribute to surface and groundwater pollution
- ▶ major agricultural sources, which contribute fertilizer and pesticides (such as atrazine and other triazines) that cause widespread water contamination
- ▶ stormwater runoff from urban and suburban areas
- ▶ combined sewer and sanitary sewer overflows (CSOs/SSOs)
- ▶ leaking aboveground or underground storage tanks
- ▶ industrial and commercial facilities and transporters responsible for oil or other toxic spills
- ▶ toxic waste sites, such as the Henderson, Nevada, Kerr-McGee site, which has contaminated the Colorado River, and resultantly the tap water of millions of people, with the rocket fuel perchlorate
- ▶ undercontrolled point sources, including poorly constructed or poorly operated sewage treatment plants and industrial facilities with weak or expired water pollution permits

The EPA also needs to enforce more strictly existing rules and abandon efforts to weaken current rules. For example, as discussed in Chapter 4, the EPA should main-

tain the current polluted water cleanup rules and should not weaken sewage treatment rules. In addition, Congress needs to step in to protect the EPA's jurisdiction to control pollution of smaller streams and wetlands (see Chapter 4). Congress also should enact stronger legislation addressing groundwater pollution, polluted runoff, CSOs/SSOs, and other poorly controlled sources.

Finally, NRDC recommends that the EPA strengthen and enforce existing health standards for tap water that are too weak, and draft and enforce new standards for those drinking water contaminants that remain unregulated. Specifically, we recommend that the EPA:

- ▶ issue new standards for:
 - ▶ perchlorate
 - ▶ radon
 - ▶ distribution systems
 - ▶ groundwater microbes
 - ▶ other emerging contaminants (see Chapter 5)
- ▶ strengthen existing standards for:
 - ▶ arsenic
 - ▶ atrazine and total triazines
 - ▶ chromium
 - ▶ *Cryptosporidium* and other pathogens
 - ▶ fluoride
 - ▶ haloacetic acids
 - ▶ lead
 - ▶ total "chlor" herbicides (e.g. acetochlor, metolachlor, methoxychlor, etc.)
 - ▶ total organophosphate pesticides
 - ▶ total trihalomethanes

VULNERABLE CONSUMERS NEED TO TAKE SPECIAL PRECAUTIONS

It is critical to note that the above recommendations are long-term solutions to improve overall drinking water quality in this country. For those people who have immediate concerns about tap water safety, NRDC brings to the fore EPA recommendations as follows: people with serious immune system problems (such as people on cancer chemotherapy or people with HIV/AIDS) consult with their health-care providers about drinking tap water in order to avoid the risk of infection from contaminated water. Pregnant women and infants may also be at special risk from certain contaminants common in many cities' tap water, like lead and chlorine by-products.

NOTES

1 "Rotting Sewer, Water Lines Tough Problems in Big Easy," *Chicago Tribune*, July 7, 2002, available online at www.win-water.org/win_news/070802article.html.

2 *2000 Drinking Water Quality Report*, Washington, D.C., Water and Sewer Authority (WASA), available online at www.WASA.com.

3 W. R. MacKenzie, et. al., "A Massive Outbreak in Milwaukee of *Cryptosporidium* Infection Transmitted Through the Public Water Supply," *New England Journal of Medicine*, 1994, 331: 161–167. The precise number of people killed by the Milwaukee outbreak is not known with certainty. Account by the *Milwaukee Journal* puts the number at more than

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100, while the "official" state and local health department count was "a minimum of 50 deaths." See Marilyn Marchione, "Deaths Continued After Crypto Outbreak: State Report Attributes a Minimum of 50 Deaths from '93 to '95." *The Milwaukee Journal Sentinel*, May 27, 1996.

4 "1,061 Suspected *E. coli* Cases in New York Outbreak," *Infectious Disease News* (October 1999), available online at www.infectiousdiseaseneews.com/199910/frameset.asp?article=ecoli.asp; Centers for Disease Control and Prevention, "Public Health Dispatch: Outbreak of *Escherichia coli* O157:H7 and *Campylobacter* Among Attendees of the Washington County Fair—New York," *MMWR*, 1999, 48(36): 803.

5 Four of the 19 cities (Fresno, Los Angeles, San Diego, and San Francisco) were presented in an earlier October 2002 California prerelease of this report.