



PHOENIX, AZ

Phoenix Earned a Water Quality and Compliance Grade of Poor in 2000 and 2001

The city water supply had a number of contaminants approaching national and draft national standards and spikes well above those standards; furthermore, the city violated monitoring standards for a number of contaminants and had a large number of previous violations prompting EPA enforcement and a consent decree in 2000.

- ▶ **Trihalomethanes**, by-products of chlorine disinfection that may cause cancer and possibly birth defects and miscarriages, averaged just below the new national standard but spiked to levels well above it.
- ▶ **Arsenic**, a known and potent human carcinogen that is linked to a variety of diseases, spiked to levels above the new national standard.
- ▶ Levels of **nitrate** approached the national standard. Nitrates are the product of fertilizers and human or animal waste and can cause shortness of breath, nausea, vomiting, diarrhea, lethargy, loss of consciousness, and even death in infants (called “blue baby syndrome”).
- ▶ The industrial chemical **di(2-ethylhexyl)phthalate (DEHP)**, a probable human carcinogen that damages the liver and testes, averaged below the national standard but spiked above it.
- ▶ **Perchlorate**, a component of rocket fuel that can harm the thyroid and poses special risks to infants and pregnant women, was found at levels above the EPA draft safe level.

Noteworthy

- ▶ The EPA took enforcement action against Phoenix for dozens of monitoring and reporting violations and some contaminant standard violations, including nitrate and DEHP. Phoenix settled in 2000 for \$350,000 in penalties, but since then the EPA data indicate numerous additional monitoring and reporting violations. After several requests, state officials said they “lack the resources” to verify whether those dozens of later violations (reported by the state itself to the EPA in 2001–2003) were accurate, though they believe that many of the reported violations did not occur.

Phoenix’s Right-to-Know Reports Earned a Grade of Failing for 2000 and 2001

- ▶ The reports incorrectly asserted that Phoenix achieved “100 percent regulatory compliance” and unlawfully failed to mention violations.
- ▶ The city failed to reveal average levels of arsenic, chromium, mercury, and thallium, reporting only the range of levels, making it impossible to know the true levels or to compare them to the EPA’s average-based standards. These omissions are in violation of right-to-know report requirements.
- ▶ Phoenix buried EPA-required warnings about the health effects of the city’s elevated arsenic and nitrate levels deep in the report, in an extremely small font as a footnote to a table.
- ▶ The reports failed to note the specific sources of contaminants.
- ▶ The reports were very hard to read because they were poorly formatted and used small fonts.
- ▶ The reports were not fully translated into Spanish, in spite of the fact that Phoenix has a large Spanish-speaking population.

Phoenix Earned a Source Water Protection Rating of Poor

Phoenix admits that groundwater contamination can be a serious local problem. The city’s surface water sources are highly susceptible to contaminated agricultural, urban, and suburban runoff, and industrial, municipal, and other pollution sources, including perchlorate from a Nevada waste site.

PHOENIX	
System Population Served	1,200,00¹
Water Quality and Compliance	2000 ▶ Poor 2001 ▶ Poor
Right-to-Know Report—Citizenship	2000 ▶ Failing 2001 ▶ Failing
Source Water Protection	Poor
REPORT CARD	

Noteworthy

► Phoenix reported that it projects a five-year drinking water infrastructure investment need of \$900 million.² Construction has begun on a 16-mile-long, 48-to-54-inch water main (including 6,000 feet of mountain tunnel).³ A 50-million-gallon-per-day (MGD) “booster” is planned to serve southeast Phoenix at a cost of approximately \$75 million.⁴ Construction also is planned to start in 2003 for a four MGD reclamation plant and in 2004 for an 80 MGD treatment plant at a cost of \$204 million dollars.⁵ To supply the rapidly growing north Phoenix area, a 320 MGD water treatment plant is planned at Lake Pleasant, with the first phase ready in 2007.⁶

KEY CONTAMINANTS IN PHOENIX’S WATER

The following contaminants have been found in Phoenix’s drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Total Coliform Bacteria

National Standard (MCL)

5% maximum in any month⁷

National Health Goal (MCLG)

0—no known fully safe level

1999 Levels⁸

Phoenix Municipal Water System: 2.2% in maximum month, total coliform positive

North Valley Water System: 9.1% in maximum month, total coliform positive—*violation*

2000 Levels⁹

Phoenix Municipal Water System: 1.1% in maximum month, total coliform positive

North Valley Water System: 0 maximum month, total coliform positive

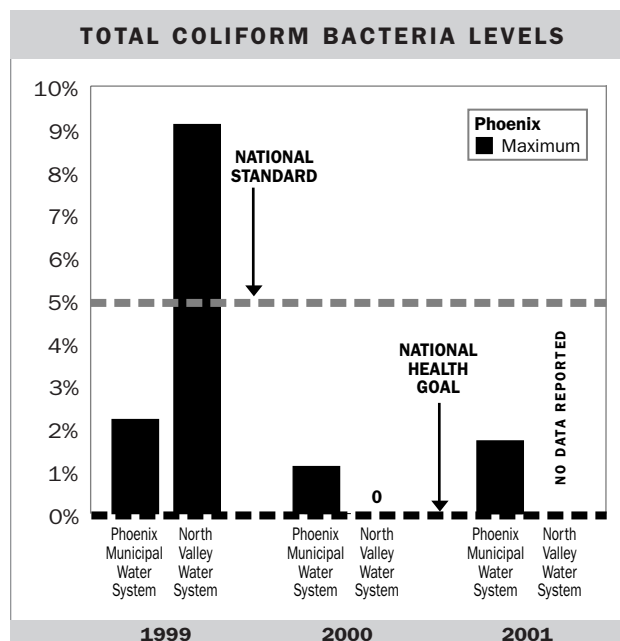
2001 Levels¹⁰

Phoenix Municipal Water System: 1.7% in maximum month, total coliform positive

North Valley Water System: data not reported; North Valley reportedly closed in 8/2000

LEVELS PRESENT SOME CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. The highest reported level of coliform bacteria in any month in Phoenix’s system was 9.4 percent, taken in the North Valley Water System in 1999. This level



violated the national standard and may have presented a significant health risk to some citizens. No violations of the coliform standard have been reported since 1999. The lower levels (1 to 2 percent) observed in 2000 and 2001 do not present a serious health risk for healthy consumers. Nonetheless, any presence of coliform bacteria in a city’s water distribution system is a potential indication that regrowth of bacteria may be occurring in city pipes.

INORGANIC CONTAMINANTS

Arsenic

National Standard (MCL)

50 ppb (average) effective through 2005

10 ppb (average) effective in 2006

National Health Goal (MCLG)

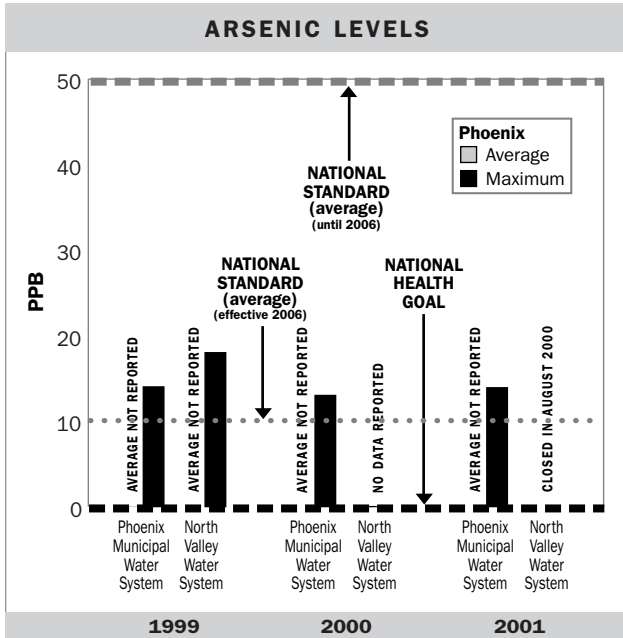
0—no known fully safe level

1999 Levels¹¹

	Average	Maximum
Phoenix Municipal Water System	not reported (in violation of EPA rules)	14 ppb
North Valley Water System	not reported (in violation of EPA rules)	18 ppb

2000 Levels¹²

	Average	Maximum
Phoenix Municipal Water System	not reported (in violation of EPA rules)	13 ppb
North Valley Water System	Data not reported; North Valley reportedly closed in 8/2000	



2001 Levels¹³

System	Average	Maximum
Phoenix Municipal Water System	not reported (in violation of EPA rules)	13.9 ppb
North Valley Water System	data not reported; North Valley reportedly closed in 2000	

Arsenic—the product of mining, industrial processes, past use of arsenic-containing pesticides, and natural leaching or erosion from rock—is a known and potent human carcinogen that has been linked to a variety of other diseases. The National Academy of Sciences has estimated that a person who consumes two liters of water a day containing 10 ppb arsenic has a lifetime fatal total cancer risk of about 1 in 333.¹⁴ But because Phoenix has unlawfully failed to report average arsenic levels for different areas of the city, precise health risk estimates are not possible.

LEVELS PRESENT HIGH CONCERN

Chromium

National Standard (MCL)

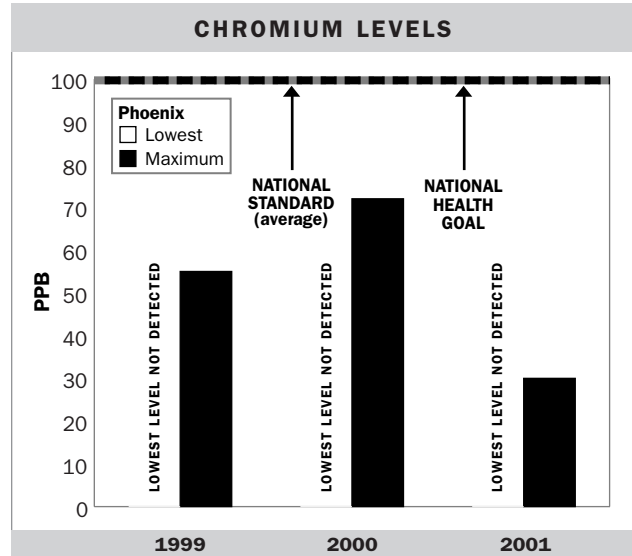
100 ppb (average)

National Health Goal (MCLG)

100 ppb

1999 Levels¹⁵

System	Average	Maximum
Phoenix Municipal Water System	not reported (in violation of EPA rules)	55 ppb



2000 Levels¹⁶

System	Average	Maximum
Phoenix Municipal Water System	not reported (in violation of EPA rules)	72 ppb

2001 Levels¹⁷

System	Average	Maximum
Phoenix Municipal Water System	not reported (in violation of EPA rules)	30 ppb

LEVELS OF SOME CONCERN

Chromium—a naturally occurring metal used in industrial processes, including metal-plating for chrome bumpers, and in making stainless steel, paint, rubber, and wood preservatives—can irritate skin and damage kidney, liver, and nerve tissues. Officials have recently engaged in heated debate over whether states and the EPA should adopt a separate standard for Chromium VI (hexavalent chromium), a form of chromium known to cause cancer when inhaled. The EPA has refused so far to consider it as a carcinogen when it is consumed in tap water. Phoenix does not reveal whether it is aware of Chromium VI levels or average levels for total chromium; this latter omission is in violation of EPA rules.

Lead

National Standard (TT)

15 ppb (action level, at 90th percentile)¹⁸

National Health Goal (MCLG)

0—no known fully safe level

1999 Levels¹⁹

Phoenix Municipal Water System: 3 ppb at the 90th percentile home

2000 Levels²⁰

Phoenix Municipal Water System: 4 ppb at the 90th percentile home

2001 Levels²¹

Phoenix Municipal Water System: 4 ppb at the 90th percentile home

LEVELS PRESENT SOME CONCERN

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior. Phoenix lead levels are relatively low.

Nitrate

National Standard (MCL)

10 ppm (peak standard; if confirmation is taken within 24 hours, then two samples are averaged)

National Health Goal (MCLG)

10 ppm

1999 Levels²²

	Maximum
Phoenix Municipal Water System	8.8 ppm
North Valley Water System	1.4 ppm

2000 Levels²³

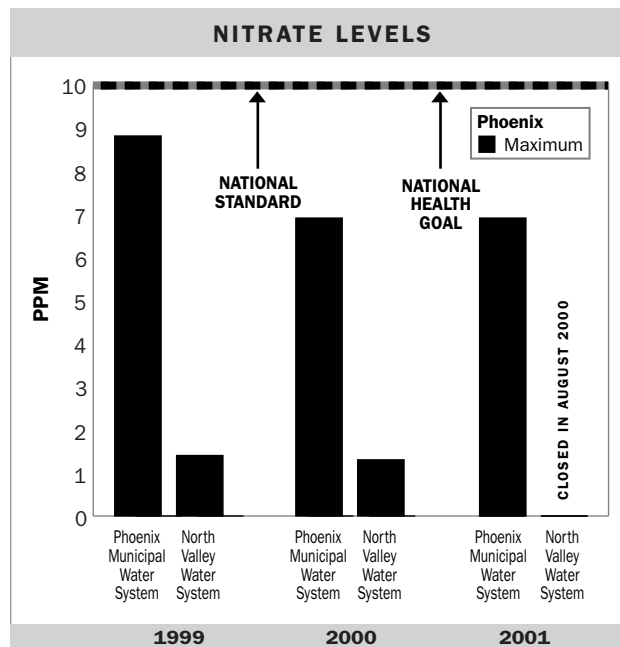
	Maximum
Phoenix Municipal Water System	6.9 ppm
North Valley Water System	1.3 ppm

2001 Levels²⁴

	Maximum
Phoenix Municipal Water System	6.9 ppm
North Valley Water System	Data not reported; North Valley reportedly closed in 2000

LEVELS PRESENT HIGH CONCERN

Nitrates are the product of fertilizers and human or animal waste and can cause shortness of breath, nausea, vomiting, diarrhea, lethargy, loss of consciousness, and even death in infants (called “blue baby syndrome”). Phoenix’s peak levels of nearly 9 ppm in 1999 approached the national standard; even the 7 ppm level in subsequent years was troubling, since there is no margin of safety in the 10 ppm standard. Phoenix warns that nitrate at 10 ppm poses a special “risk for infants less than six months old,” that high nitrate levels can cause blue baby syndrome, can occur suddenly after rainfall, and should be taken seriously: for example, the city water supplier notes



that “if you are caring for an infant, you should ask for advice from your health care provider” about whether to use city water for the child.²⁵ The EPA filed an enforcement action against Phoenix alleging that in previous years, the city had violated the nitrate standard; the EPA and Phoenix reached a consent decree in 2000 in which the city agreed to pay a large fine and to take steps to address this and many other alleged violations (see section below on Phoenix’s compliance problems).

Perchlorate

National Standard (MCL)

None established

National Draft Safe Level (“Drinking Water Equivalent Level,” or DWEL)²⁶

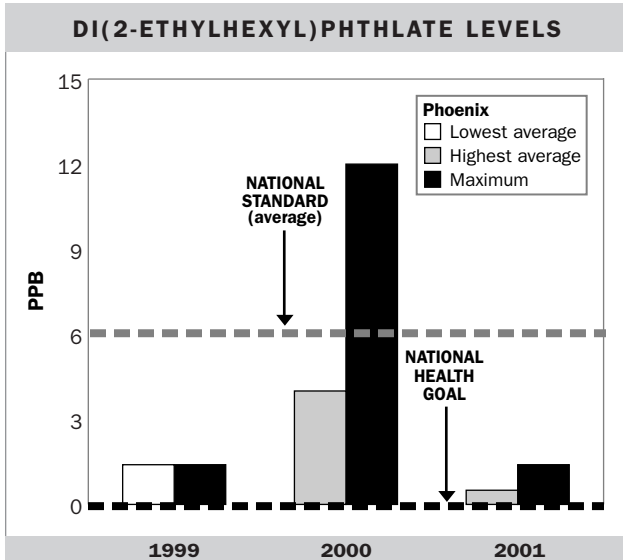
1 ppb

2000 Levels²⁷

Phoenix Municipal Water System: 5 ppb (two samples)

LEVELS PRESENT HIGH CONCERN

Perchlorate, an inorganic contaminant that usually comes from rocket fuel spills or leaks at military facilities, harms the thyroid and may cause cancer. Perchlorate from a Kerr-McGee facility in Nevada has contaminated the Colorado River (which supplies some of Phoenix’s water via the Central Arizona Project). It was found in Phoenix tap water at levels up to 5.3 ppb



in 2000—more than five times higher than the recently issued national draft safe level of 1 ppb.²⁸

ORGANIC CONTAMINANTS

Di-(2-ethylhexyl)Phthalate

National Standard (MCL)

6 ppb (average)

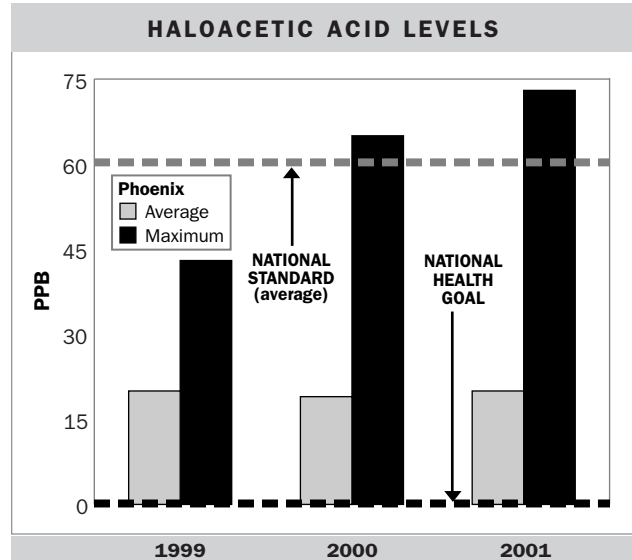
National Health Goal (MCLG)

0—no known fully safe level

1999 Levels ²⁹	Average	Maximum
Phoenix Municipal Water System	1.4 ppb	1.4 ppb
2000 Levels ³⁰	Average	Maximum
Phoenix Municipal Water System	4 ppb	12 ppb
2001 Levels ³¹	Average	Maximum
Phoenix Municipal Water System	0.5 ppb	1.4 ppb

LEVELS PRESENT SOME CONCERN

Di-(2-ethylhexyl)phthalate (DEHP)—a plasticizing agent used widely in the chemical and rubber industries and contained in many plastics—is a probable human carcinogen and also causes damage to the liver and testes.³² DEHP levels in 2000 in Phoenix water are of concern, as they averaged two-thirds of the national standard and spiked to twice the national standard. The EPA alleged that in past years Phoenix distributed water violating the DEHP standard, and in 2000 the EPA and Phoenix signed a consent decree in which Phoenix paid fines and promised to take steps to address this and many other violations (see section below on Phoenix’s compliance prob-



lems). The lower levels reported in 2001 are promising, but careful monitoring of the situation and identification of the source of the DEHP pollution are warranted.

Haloacetic Acids

National Standard (MCL)

60 ppb (average) effective in 2002; no previous standard

National Health Goal (MCLG)

0—no known fully safe level³³

1999 Levels ³⁴	Average	Maximum
Phoenix Municipal Water System	20 ppb	43 ppb
2000 Levels ³⁵	Average	Maximum
Phoenix Municipal Water System	19 ppb	65 ppb
2001 Levels ³⁶	Average	Maximum
Phoenix Municipal Water System	20 ppb	73 ppb

LEVELS PRESENT SOME CONCERN

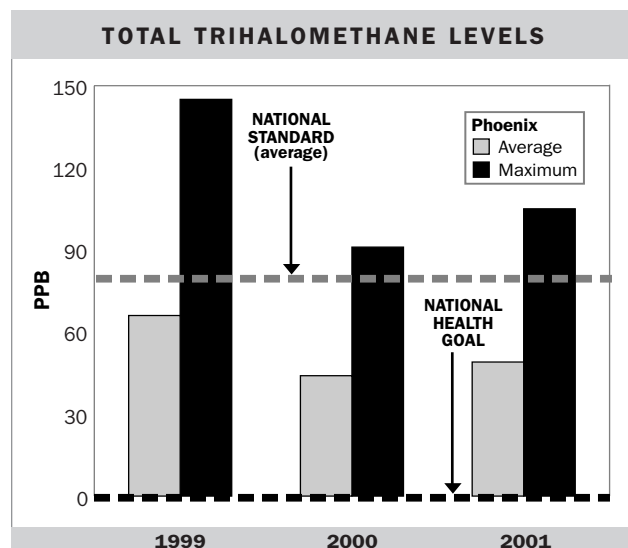
Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. Haloacetic acids have been found in Phoenix’s water at levels that average well below the national standard but above the national health goal. Spikes of HAAs in Phoenix water occasionally exceed the national standard.

Total Trihalomethanes

National Standard (MCL)

100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

National Health Goal (MCLG)



0—there is no known fully safe level³⁷

Year	Average	Maximum
1999 Levels ³⁸		
Phoenix Municipal Water System	66 ppb	145 ppb
2000 Levels ³⁹		
Phoenix Municipal	44 ppb	91 ppb
2001 Levels ⁴⁰		
Phoenix Municipal	49 ppb	105 ppb

LEVELS PRESENT HIGH CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects.⁴¹ Phoenix has moderate to relatively high levels of TTHMs in its drinking water. Indeed, the city’s highest TTHM levels have frequently spiked above the new national standard; because preliminary studies may indicate health risks even at those spike levels, women in the first three months of pregnancy should exercise caution, according to Dr. David Ozonoff, chair of the Environmental Health Department at Boston University School of Public Health.

PHOENIX’S HISTORY OF WATER QUALITY AND COMPLIANCE VIOLATIONS AND PROBLEMS

The Phoenix Municipal Water System had a long series of significant and minor monitoring and MCL violations between 1993 and 2000.⁴²

Monitoring, Reporting, and Standard Violations

In March, April, and May 2000, according to EPA data, the water system incurred a significant filter monitoring violation under the Surface Water Treatment Rule because it failed to take a large percentage of the required samples. On August 31, 2000, a consent decree was filed in the United States District Court of Arizona.⁴³ As part of it, Phoenix agreed to pay a \$350,000 civil penalty to the U.S. EPA and the state of Arizona for falling short of drinking water monitoring, reporting, and contaminant standard requirements during the years 1993–1996; another component of the consent decree was an agreement that the city would complete two projects with Arizona State University in order to improve the quality of Phoenix’s drinking water.⁴⁴ Previously, in November 1996, Phoenix received notices of violation from the U.S. EPA and the Arizona Department of Environmental Quality, including but not limited to:

- ▶ distribution of water that had levels of nitrate and DEHP that violated the MCLS (maximum contaminant levels)
- ▶ failure to notify the state drinking water authorities within 24 hours of the violations
- ▶ failure to perform increased quarterly nitrate monitoring as required after samples taken on dates in 1993–1996 showed nitrate levels between 5 and 10 ppm
- ▶ failure to perform increased quarterly DEHP chemical monitoring after samples taken indicated levels above the national health standard
- ▶ failure to notify people drinking Phoenix tap water of the availability of monitoring results for unregulated contaminants, among other public notice violations
- ▶ failure to complete groundwater inorganic chemical monitoring for arsenic, barium, cadmium, chromium, fluoride, mercury, and selenium
- ▶ violation of asbestos monitoring rules⁴⁵

The consent decree did not resolve violations described in a December 1998 Notice of Violation that the EPA issued to the city of Phoenix.

Additionally, according to EPA records, for five months in 2000, eight months in 1999, and during some months of 1998, 1997, 1996, 1995, and 1993, the Phoenix system did not adequately monitor for total coliform because it failed to take some of the required samples.⁴⁶

These monitoring violations do not appear to be included in the consent decree. Neither are they mentioned in Phoenix's right-to-know reports.

According to data posted by the EPA based upon Arizona state filings with the agency, in 2001–2003 Phoenix violated monitoring and reporting requirements many times for chemicals ranging from nitrates to numerous industrial chemicals.⁴⁷ These federal computer records indicate that after the consent decree was reached, Phoenix then violated monitoring and reporting requirements more than 30 times between 2001 and 2003—including failures to monitor for nitrate, 1,2-dichloroethane, paradichlorobenzene, trichloroethylene, and many other contaminants.⁴⁸

After several inquiries from NRDC, state officials told us (in 2002 and again in 2003) that they simply lack the resources to track down and verify the accuracy of the dozens of monitoring violations for Phoenix reported by the state into EPA's computer database from 2001 to 2003.⁴⁹ After NRDC requested that Arizona state drinking water officials detail and verify the accuracy of the state's official violation reports (which are required by federal law to be accurate), state officials responded that they suspected that "most or all" of these 2001 to 2003 violations either were incorrectly reported to the EPA or were reported but "corrected" later.

Arizona officials explained that some of the violations were recorded because Phoenix removed from service some "points of entry" (that is, the city stopped using water from certain wells or other sources) and therefore ceased the testing associated with those sources—but had failed to inform the state of the change, triggering a record of violation.⁵⁰ This would not explain all the reported violations, but the state said it "lacks the staff and resources" to verify the facts.⁵¹ The state says it is planning to change to a new computer system in order to better track violations.⁵² However, it remains troubling that Arizona's largest city, with a multiyear history of EPA violations, continues to have problems complying with basic requirements of the Safe Drinking Water Act and that Arizona has not dedicated the resources to vigorously verify compliance.

An Incident Involving Untreated Canal Water

According to a February 2002 article in the *Phoenix New Times*, some Phoenix residents unknowingly drank untreated irrigation water that reached the drinking water system from a home that did not have a back-flow protector. The city's water services department reportedly failed to notify the county of the problem until nearly a month after the incident—even though the required notification time frame is 24 hours. The paper reported that the county issued a cease-and-desist order to the city requiring Phoenix to notify people who may have consumed the untreated drinking water; published accounts say the city has done a small mailing to some customers.⁵³

The Safe Drinking Water Information System

As noted above, the findings of this report regarding violations have relied in part on data available online via a U.S. EPA database called the Safe Drinking Water Information System (SDWIS-FED). The City of Phoenix Water Services Department has acknowledged that there are discrepancies between the city's drinking water data and the Phoenix data as presented by SDWIS-FED.⁵⁴ The discrepancies remain, in spite of queries sent by NRDC to the state and the city, as well as telephone calls from NRDC to EPA Region IX and the Arizona Department of Environmental Quality. As a result, NRDC has cited SDWIS-FED data and a print-out of state data obtained from Arizona DEQ as the only data publicly available. It is important to note that the data Arizona reports into SDWIS-FED is required by federal law to be submitted in an accurate and timely manner.

PHOENIX'S RIGHT-TO-KNOW REPORTS

Phoenix's Right-to-Know Reports Earned a Grade of Failing for 2000 and 2001

On the could-be-a-better-citizen side of the ledger:

► The 1999 and 2000 right-to-know reports falsely assert that Phoenix achieved "100 percent regulatory compliance."⁵⁵ The reports fail to mention dozens of violations cited by the EPA, including those for which Phoenix had to pay \$350,000 in penalties. Failure to disclose monitor-

ing, reporting, or other violations and failure to provide the public with a “clear and readily understandable explanation of the violation” in the right-to-know report are two discrete violations of federal law.⁵⁶

► The 2001 right-to-know report failed to disclose all but one of the reported monitoring violations—which is in itself a violation of federal law. The 2001 report also misleadingly stated that Phoenix “met or surpassed all health and safety standards for drinking water,” that “all required testing was conducted for all wells, showing total compliance with all standards,” and that “Phoenix tested for nearly 200 substances, even though tests are necessary for only about 110 substances.”⁵⁷ The report did not mention 30 chemical monitoring violations reported by the EPA in 2001, and it failed to note the violations and the \$350,000 in penalties paid by Phoenix in the consent decree in 2000.

► Phoenix’s 2001 report buried deep in the report EPA-required warnings about the health effects of the city’s elevated arsenic and nitrate levels, in a small font as a footnote to a table.

► The prominent “Table of Detected Contaminants” in the 1999 report failed to note that the North Valley Water System violated the total coliform bacteria health standard—denoting a failure to comply with EPA regulations requiring clear delineation of health standard violations in a table.⁵⁸

► The reports failed to state average levels detected for many contaminants, such as arsenic, chromium, mercury, and thallium. Only minimum and maximum levels were provided, rendering it impossible to determine the true level of these contaminants to which citizens were exposed. Federal law requires that averages be provided in the right-to-know report.⁵⁹

► Phoenix did not accurately describe the ground-water sources of the city’s drinking water, failing to list aquifer names and other information required by federal law.⁶⁰

► Phoenix failed to include maps or descriptions of specific contaminant sources (for phthalate, nitrates, perchlorate, *e.g.*) in the city’s tap water. EPA rules require utilities to specifically identify known sources of contaminants in source water.⁶¹

► Phoenix did not describe the health effects of many contaminants found at levels above the EPA health goals (such as trihalomethanes, haloacetic acids, and DEHP). Although not legally required, this information would have been useful for Phoenix citizens.

► The form of the report was poor. The layout of the text was compact and dense, without graphics, and daunting. The font was very small, thereby making it more difficult to read. The tables of detected regulated and unregulated contaminants used even smaller fonts and were not well organized.

► The right-to-know report was not translated into Spanish. According to the 2000 U.S. Census, 32 percent of the Phoenix population speaks a language other than English at home (more than a quarter, 27 percent, of the city population speaks Spanish at home). Fully 15 percent of the city’s population speaks Spanish and “speaks English less than very well.” EPA rules require that systems serving “a large proportion of non-English speaking residents” must provide information on the importance of the report in the relevant language(s) or a phone number or address where citizens can get a translated copy of the report or assistance in their language.⁶² The reports made one small reference in Spanish to their importance and offered a telephone number for more information in Spanish, but a full, readily available Spanish translation is recommended.

THREATS TO PHOENIX’S SOURCE WATER

Phoenix Earned a Source Water Protection Grade of Poor

Surface Water Supplies

Water is a precious commodity in a desert city like Phoenix—the largest city in Arizona and the sixth largest city in the country. Phoenix obtains most of its source water for drinking (more than 90 percent) from the Salt, Verde, and Colorado Rivers.^{63, 64} The Colorado River water is channeled to Phoenix through a canal system called the Central Arizona Project (CAP), which serves Tucson and other municipalities. According to CAP, more than 20 million people are drinking Colorado River water every day.⁶⁵ The region including Phoenix is one of the fastest growing regions in America; in fact, just in the past

decade, the population of Phoenix increased more than 34 percent.⁶⁶ Although some may consider this river to be a “renewable” resource, the Colorado River water usage is currently at or beyond full capacity. If development continues at the same rate or in the event of a drought, a large-scale water shortage among Colorado River users would be likely—leaving users to turn to area groundwater supplies, which are already in perilous condition.

Groundwater Supplies

The remaining source water for Phoenix’s drinking water, delivered by the North Valley Water Treatment System, comes from groundwater wells. Groundwater levels across Arizona are declining in quantity and quality as a result of overuse; according to CAP authorities, Arizona takes out approximately 2.5 million more gallons of groundwater than can be naturally recharged.⁶⁷ In January 2002, the Center for Biological Diversity filed a lawsuit challenging the Arizona water law that allows surface water and groundwater aquifer depletion.⁶⁸

The Lower Salt Watershed: The Salt and Verde Rivers

The U.S. EPA’s Index of Watershed Indicators (IWI) has determined that Phoenix’s Lower Salt Watershed is of better quality and lower vulnerability than is the Verde, but the upstream Carizo Watershed is ranked as having “more serious” water quality problems.⁶⁹ Therefore, the IWI assigned an overall index score of 5 (1 equals low threat and 6 equals highest threat) to the Carizo, a 2 to the downstream Lower Salt Watershed, and a 3 to the Verde Watershed.⁷⁰

Rating Threats to Phoenix Source Waters

Based on our analysis of the data pertaining to area water quality and quantity data, NRDC has rated Phoenix as Poor for its efforts to control threats to source water. The most “prevalent causes” of source water pollution as identified by IWI include low dissolved oxygen, salinity/chlorides, unknown toxic materials, metals, and suspended solids. Sources of these pollutants include changes in the hydrology of the source water, agriculture, and industry. From 1991 to 1999, 50 to 100 percent of the population was served by community water systems with violations or treatment for chemical con-

taminants. Zero to 5 percent of ambient surface water samples contained chemical levels exceeding one half of the drinking water standard from 1990 to 1998.⁷¹

Urban runoff occurs when water passes through an urban environment, picking up particles, dirt, and chemicals, and flows into the water resources of the area. Phoenix’s watershed and its drinking water sources experience a heavy load of pollutants in urban runoff. The vulnerability indicator of urban runoff potential for Phoenix therefore is high, with 13 percent of the land area having more than 25 percent imperviousness.⁷²

The vulnerability indicator of agricultural runoff potential (which is a composite of nitrogen runoff, pesticide runoff, and sediment delivery) is considered to have a moderate level of impact, with a moderate potential for pesticide runoff, nitrogen runoff, and sediment delivery to rivers and streams.⁷³

Industrial Wastelands in Phoenix

There are at least 16 toxic sites in Phoenix awaiting cleanup, but resolution is nowhere in sight. *The Arizona Republic* reports that since the inception of the state toxic site cleanup program in 1986, not one of these sites has undergone groundwater or soil remediation. At least two sites have reportedly leached contaminants such as perchloroethylene into groundwater aquifers.⁷⁴ Although these contaminated groundwater supplies are not supposed to be used for drinking water purposes, such groundwater contamination contributes to the overall degraded state of Phoenix’s aquifers.

Source Water Assessment Program

Arizona drinking water authorities are involved in the Source Water Protection Program (SWAP), which is required by the Safe Drinking Water Act. In its published 67-page Final Draft Source Water Assessment Plan, the Arizona Department of Environmental Quality (ADEQ) contains measures that will allow the department to catalog the source waters for each system in Arizona (including Phoenix) and the land uses close to the source waters. The final plan describes the process that should be used in order to compile the Final Source Water Assessment Reports. In carrying out the SWAP, ADEQ plans to

evaluate the risk of each public water system (PWS) from contamination. Once that risk has been determined, land uses close to the particular PWS (in this case, Phoenix) will be reviewed for possible contamination problems.⁷⁵

PROTECTING PHOENIX'S DRINKING WATER

The following are approaches to treating Phoenix's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

The city of Phoenix has five surface water treatment plants (WTP): Verde, Val Vista, Squaw Peak, Deer Valley, and Union Hill.⁷⁶ Construction of another water treatment plant, the Lake Pleasant WTP, has been planned. At these plants, water is treated generally with the same measures: sedimentation (slowing the flow of water to let big particles settle), coagulation (addition of a chemical that causes mud and particles to clump and sink to the bottom), filtration (using sand, gravel, and hard anthracite coal), and chlorine disinfection. On average, about 4 percent of the drinking water comes from deep wells; some is reported to be wastewater that had been treated and then injected into the ground and then withdrawn to use as drinking water.

Phoenix Water Services reportedly has a 2001–2006 five-year water capital improvement program in the works, designed around three different areas: reliability/growth, rehabilitation/replacement, and environmental.⁷⁷

Treatment to Reduce Arsenic

The proposed plan budgeted \$75 million for arsenic removal. As discussed in the previous section, arsenic levels reported to be present in parts of Phoenix's drinking water were above the new national standard of 10 ppb. Treatment options available to reduce arsenic levels may include using activated alumina, anion exchange, or other technologies at a cost of approximately \$20 per household per year, according to EPA estimates for a system of Phoenix's size.

Treatment to Reduce Disinfection By-Products (Such as Trihalomethanes and Haloacetic Acids) and to Eliminate Taste and Odor Problems

Phoenix has relatively high disinfection by-product levels, which could be reduced by using ozone or ultraviolet light as a primary disinfectant. The city could further reduce levels of by-product contaminants by installing granular activated carbon (GAC). GAC would have the enormous benefit of reducing most other organic contaminants and would take care of the musty algae-caused taste and odor problems that many Phoenix residents commonly cite. GAC could eliminate many of the other organic chemicals found in the city's water; other cities have installed this technology at a cost of about \$25 per household. Phoenix asserts that the cost of GAC would be about \$325 million, plus about \$5 to 10 million per year to operate and maintain; the city argues that this would not be worth the expense in order simply to improve taste and odor.⁷⁸ However, taste and odor control would be only one benefit of GAC; GAC would also reduce levels of cancer-causing (and possibly miscarriage- and birth defect—inducing) disinfection by-products, as well as other synthetic organic chemical contaminants.

In addition, although Phoenix claims never to have found viable *Cryptosporidium* in its water, ozone and ultraviolet light would offer a measure of additional assurance that *Crypto* would pose no risk to city residents (these disinfection technologies are far more effective at killing these and certain other resistant parasites than is chlorine).

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving

PHOENIX

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WATER UTILITY INFORMATION

water in their daily lives and by getting involved in community decision making about water resources.

► **Attend meetings of your local water supplier** (contact information below). Ask for dates, times, and locations.

► **Get involved with local efforts to ensure safe drinking water** by contacting the Friends of Arizona Rivers, 602-265-4325, and the Center for Biological Diversity, 602-246-4170; www.biologicaldiversity.org/swcbd/

► **Get involved in source water assessment and protection efforts.** Find a state government contact by calling the Safe Drinking Water Hotline at 800-426-4791.

► **Learn more from the:**

► Clean Water Network, www.cwn.org

Peer reviewers for the Phoenix report included Diana Neidle, Consumer Federation of America; Phyllis Rowe, Arizona Consumers Council; Doris Cellarius, Sierra Club Toxics Campaign.

NOTES

1 Safe Drinking Water Information System (SDWIS-FED), U.S. EPA database, available online at: http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=687801&pwsid=WA5377050&state=WA&source=Surface%20water%20&population=595430&sys_num=0. Printout, 5/24/01, provided by the city of Phoenix.

2 "Larger Cities Report Capital Improvement Needs," *WaterWorld: Water and Wastewater Technology*, December 2001, available online at www.pennet.com/Articles.

3 Ibid.

4 Ibid.

5 Ibid.

6 Phoenix Water Services Department, "Lake Pleasant Water Treatment Plant: Overview," available online at www.phoenix.gov/LPWPDPBO/overview.html.

7 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

8 Phoenix Water Services Department, "1999 Water Quality Annual Report," table entitled "1999 Distribution System Sampling," available online at www.ci.phoenix.az.us/WATER/qualre99.html, last visited March 25, 2002.

9 Phoenix Water Services Department, "2001 Water Quality Annual Report," available online at www.phoenix.gov/WATER/qualrept.html.

10 Phoenix Water Services Department, "2000 Water Quality Annual Report," table entitled "2000 Distribution System Sampling," available online at www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.

11 Phoenix Water Services Department, "1999 Water Quality Report," listed in table entitled "1999 Detected Inorganic Substances at Points where water

enters the Distribution System," available online at www.ci.phoenix.az.us/WATER/qualre99.html, last visited March 25, 2002.

12 Phoenix Water Services Department, "2000 Water Quality Report," listed in table entitled "2000 Detected Inorganic Substances at Points where water enters the Distribution System," available online at www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.

13 See note 9.

14 National Academy of Sciences (NAS), National Research Council, *Arsenic in Drinking Water: 2001 Update*, National Academy Press, 2001, available online at www.nap.edu/catalog/10194.html. The accompanying press release, also available on the website, explains the NAS risk calculations. In providing Albuquerque's cancer risk estimate, NRDC has interpolated between the NAS's 10 and 20 ppb risk estimates.

15 See note 11.

16 See note 12.

17 See note 9.

18 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

19 Phoenix Water Services Department, "1999 Water Quality Report," listed in table entitled "1999 Results of Lead and Copper Sampling from Residential Water Taps," available online at www.ci.phoenix.az.us/WATER/qualre99.html, last visited March 25, 2002.

20 Phoenix Water Services Department, "2000 Water Quality Report," listed in table entitled "2000 Results of Lead and Copper Sampling from Residential Water Taps," available online at www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.

21 See note 9.

22 See note 11.

23 See note 12.

24 See note 9.

25 Phoenix Water Services Department, "2001 Water Quality Annual Report," p. 5, footnote to table, available online at www.phoenix.gov/WATER/qualrept.html.

26 A DWEL is the presumed level of perchlorate that one would need to consume in tap water to reach the Reference Dose—the maximum safe level. See EPA, "Perchlorate," Fact Sheet, available online at www.epa.gov/safewater/ccl/perchlor/perchlo.html.

27 Phoenix Water Services Department, "2000 Water Quality Report," www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.

28 See note 26.

29 See note 11.

30 See note 12.

31 See note 9.

32 Agency for Toxic Substances and Disease Registry (ATSDR), *ToxFaqs for Di-(2-ethylhexyl)Phthalate*, available online at www.atsdr.cdc.gov/tfacts9.html, last visited 03/25/02; "EPA Consumer Fact Sheet on Di-(2-ethylhexyl)phthalate," available online at www.epa.gov/safewater/dwh/c-soc/phthalat.html.

- 33 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.
- 34 See note 11.
- 35 See note 12.
- 36 Phoenix Water Services Department, "2001 Water Quality Annual Report," available online at www.phoenix.gov/WATER/qualrept.html.
- 37 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.
- 38 See note 11.
- 39 See note 12.
- 40 See note 36.
- 41 See note 31.
- 42 Safe Drinking Water Information System (SDWIS-FED), U.S. EPA database, available online at http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=629736&pwsid=AZ0407025&state=AZ&source=Surface%20water%20&population=1200000&sys_num=0.
- 43 Notice of Lodging of Consent Decree, Consent Decree, *United States of America and State of Arizona, ex. rel Jacqueline E. Schafer, Director, Arizona Department of Environmental Quality, v. City of Phoenix, Arizona*, United States District Court, District of Arizona, filed August 31, 2000.
- 44 EPA press release, "Phoenix to Pay Largest Drinking Water Fine in State History," August 31, 2000.
- 45 Notice of Violation, re: City of Phoenix Water Services Department, PWS ID #07-025, issued by Arizona DEQ on November 18, 1996.
- 46 See note 42.
- 47 Ibid.
- 48 See note 42.
- 49 Personal communications with Jeff Stuck and John Calkins, Arizona Department of Environmental Quality, September 2002; Personal communications with John Calkins, Arizona Department of Environmental Quality, February and March 2003.
- 50 Personal communications with John Calkins, Arizona Department of Environmental Quality, February and March 2003.
- 51 Ibid.
- 52 Ibid.
- 53 Silverman, Amy, "Drinking Problem: Unsuspecting Neighbors Recently Tapped Into Contaminated Water," *Phoenix New Times*, February 7, 2002.
- 54 Letter from Michael Gritzuk, P.E., water services director, City of Phoenix Water Services Department, to Erik Olson, NRDC, June 1, 2001.
- 55 See, e.g., Phoenix Water Services Department, "2000 Water Quality Annual Report," available online at www.ci.phoenix.az.us/WATER/qualre00.html and Phoenix Water Services Department; *1999 Water Quality Annual Report*, available online at www.ci.phoenix.az.us/WATER/qualre99.html.
- 56 See 40 C.F.R. §141.153(f), which requires disclosure in the annual right-to-know report (or "consumer confidence report") of all monitoring and reporting violations.
- 57 See note 9.
- 58 See 40 C.F.R. §141.153(d)(6), requiring the right-to-know report's table to clearly indicate that a violation occurred.
- 59 See 40 C.F.R. §141.153(d)(4)(iv), requiring the right-to-know report table to include average level of a contaminant for which compliance with the Maximum Contaminant Level is determined based upon average levels.
- 60 See 40 C.F.R. § 141.153(b)(1)(ii).
- 61 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator." While the EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution or where the water system is aware of the pollution source, the rules require that polluters be identified.
- 62 See 40 CFR §141.153(h)(3).
- 63 City of Phoenix Water Services Department website, available online at www.ci.phoenix.az.us/WATER/drink.html, last visited March 25, 2002.
- 64 Phoenix Water Services Department, "2000 Water Quality Report," available online at www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.
- 65 Available online at www.cap-az.com, last visited March 21, 2002.
- 66 U.S. Census Bureau, *Ranking Tables for Metropolitan Areas: 1990 and 2000*, available online at www.census.gov/population/cen2000/phc-t3/tab01.pdf, last visited March 25, 2002.
- 67 CAP website, FAQ, available online at www.cap-az.com, last visited March 21, 2002.
- 68 Center for Biological Diversity website, "Challenge Mounted to Reform Arizona Water Law," February 21, 2002, available online at www.endangeredeearth.org/alerts/result-m.asp?index=1078, last visited March 25, 2002.
- 69 See EPA, IWI Database, available online at www.epa.gov/iwi/hucs/15060104/score.html and www.epa.gov/iwi/hucs/15060103/score.html. This data has not been verified by the city of Phoenix. See letter to Erik Olson of NRDC from Michael Gritzuk, P.E., water services director, City of Phoenix, June 1, 2001, p. 1.
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- 71 Ibid.
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- 73 Ibid.
- 74 Pitzl, Mary Jo, "33 Toxic Sites in Arizona Never Cleaned. State Budget Crisis Could Add to 16-Year Delay," *The Arizona Republic*, March 8, 2002, available online at www.azcentral.com, last visited March 20, 2002.
- 75 ADEQ printout, from ADEQ website, "WQD: Drinking Water: Monitoring and Assessment: Source Water Assessment Program," available online at www.adeq.state.az.us/environ/water/dw/swap.html.
- 76 Phoenix Water Services Department, "2000 Water Quality Report," available online at www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.
- 77 City Council Report from Michael Gritzuk, P.E., to George W. Britton, deputy city manager, Water Services Department Fiscal Years 2001–2002 to 2005–2006 Water Capital Improvement Program.
- 78 Phoenix Water Services Department, "2001 Water Quality Annual Report," available online at www.phoenix.gov/WATER/qualrept.html.
- 79 Phoenix Water Services Department, "2000 Water Quality Annual Report," available online at www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.