San Diego[1]

San Diego earned water quality and compliance grades of Fair in 2001 and 2000.

San Diego has no recent reported violations of current, pending, or proposed standards for water, but it does face some significant water quality issues.

Some areas of San Diego have high levels of cancer-causing chlorination byproducts (total trihalomethanes, or TTHMs), averaging just below the new EPA standard. In 2001, for example, San Diegans served by the Otay treatment plant had water in their taps with average TTHM levels of about 70 parts per billion (ppb), and peak levels of 95 parts per billion. The new EPA standard, effective in 2002, is an average of 80 parts per billion. While no apparent violations occurred, these high levels of TTHMs present a health concern, including a risk of cancer. The EPA announced the reduced TTHM standard more than eight years ago, in July 1994, after extensive regulatory negotiations resulted in an agreement with the water industry—a process of which San Diego was well aware and in which its wholesaler, the Metropolitan Water District of Southern California (MWD), participated.[3] The final rule was issued in 1998.[4]

Water from parts of the San Diego system contains the unregulated contaminant perchlorate, used in rocket fuel and explosives, at levels up to 4.8 parts per billion—higher than California's January 2002 action level of 4 parts per billion, and *much higher* than the 1 part per billion draft safe level proposed by the EPA in its recently issued draft drinking water equivalent level (DWEL). Perchlorate interferes with thyroid function. San Diego reports the average levels of perchlorate served by the Miramar plant were "less than 4.07 parts per billion," without citing the exact average, but some of the system had higher spikes.

At various times, several other contaminants were found in San Diego tap water at levels in excess of EPA health goals, albeit below enforceable standards. These included the carcinogen and reproductive toxin ethylene dibromide, lead, coliform bacteria, and three cancer-causing radioactive contaminants—gross alpha radiation, gross beta radiation, and uranium. Though not found at levels high enough to trigger violations, these contaminants pose a health concern since they occur at levels in excess of EPA health goals.

San Diego earned a Fair for its 2000 and 2001 right-to-know reports.

On the "good citizen" side of the ledger:

▶ The format of the right-to-know reports and tables was relatively user friendly.

▶ The reports made no overarching claim that the water is absolutely safe, as did some other cities' reports.

▶ San Diego translated the reports into Spanish and distributed them upon request to residents. An EPA-translated announcement about the importance of the report,

NRDC
THE EARTH'S BEST DEFENSE

WHAT'S ON TAP?

Grading Drinking Water in U.S. Cities

EARLY RELEASE
CALIFORNIA EDITION

October 2002

SAN DIEGO

System Population Served
1.2 million[2]

Water Quality and Compliance
2000 ▶ Fair
2001 ▶ Fair

Right-to-Know Report—Citizenship
2000 ▶ Fair
2001 ▶ Fair

Threats to Source Water
Imported Water **5**
Local **2**
(1=least threat to 6=highest threat)

REPORT CARD

along with a call for citizens to get it translated by someone who can understand it, was printed in six other languages on the report cover.

▸ The 2001 report included helpful information on the health effects of two important contaminants found in San Diego tap water at levels below EPA standards—perchlorate and trihalomethanes (TTHMs). The 2000 report also provided some information on TTHMs' effects. Although this information was incomplete for its failure to mention possible reproductive effects from TTHM exposure as identified in several studies, it commendably went beyond what the EPA requires by providing useful health effects information.

On the right-to-know, "not-so-good citizen" side of the ledger:

▸ The 2000 and 2001 reports both failed to disclose the results of the city's lead and copper monitoring. The most recent lead and copper test results are legally required to be disclosed in the right-to-know report.[5] San Diego revealed in 1999 that 10 percent of homes in the city had more than 5 parts per billion lead in their tap water, a finding that parents of infants and young children should have been told about in the 2000 and 2001 reports.[6]

▸ The reports failed to disclose the levels of several regulated contaminants found in the city's water, an apparent violation of EPA's rules for right-to-know reports. For example, in testing done in 2001,[7] San Diego found arsenic at levels reaching 1.7 parts per billion, barium at up to 83 parts per billion, chromium at up to 3.4 parts per billion, copper at up to 20 parts per billion, and selenium at up to 4.9 parts per billion. But the 2001 right-to-know report never mentioned these findings. While these contaminants were found at levels below EPA standards, some may be of health interest to consumers, including the arsenic and some of the radioactive contaminant findings that exceed the EPA health goals and present a cancer risk. EPA regulations clearly require that citizens be informed of these findings.[8]

▸ Similarly, San Diego's 2001 report did not acknowledge the presence of the gasoline additive MTBE in the city's water. San Diego's main supplier, the Metropolitan Water District of Southern California (MWD), has said that MTBE was in water delivered to the city in 2001. Interestingly, San Diego's 1999 report noted MTBE levels. EPA rules "strongly encourage," but do not require, disclosure of findings of such unregulated contaminants.

▸ The 2000 and 2001 reports included no information on specific known polluters of San Diego's watershed or aquifer, nor did they map or otherwise indicate the locations or types of such polluters. San Diego gave only generalized information on the *types* of facilities that may cause some pollutants (such as EDB and selenium) to contaminate city tap water, but EPA and California rules require utilities to name any specific known or likely sources of a regulated contaminant found in tap water.[9] For example, San Diego and the Metropolitan Water District are well aware that the source of the perchlorate contamination in the city's water supply that comes from the Colorado River is a Kerr-McGee plant in Nevada, but the RTK report never mentioned the plant, or any other source of perchlorate.[10] Even where EPA rules do not require such specific notice about a specific polluter, or where the specific polluter

cannot be tied with assurance to a specific contaminant, EPA encourages water systems to highlight significant sources of contamination in the watershed. Dissemination of such information helps increase consumer awareness of the importance of protecting the watershed.

▶ The reports did not explain how San Diego's water is treated.

▶ The reports did not provide average levels of some contaminants, only the range of detections and a statement that the average level was "less than" a certain value. EPA rules require that the average level be disclosed. For example, the reports stated that the average level of haloacetic acids and certain radioactive contaminants was less than a certain level, but never revealed an average value. This obscuring of the actual level made it difficult for residents to compare the levels of particular contaminants to the EPA standard.

The need for major capital investments.

San Diego estimates that it will need to spend $146.5 million on drinking water capital investments in 2002, and has a five-year capital investment need of $528.5 million to upgrade, replace, and expand current facilities.[11] This figure includes near-term upgrade and expansion of two plants, the Alvarado Water Treatment Plant ($197.5 million), and the Miramar Water Treatment Plant ($143.5 million). It also includes water main replacements costing $50 million.[12]

In addition, San Diego Water's Public Advisory Group issued a long-term "Strategic Plan for Water Supply" in 1997 urging a $773 million Capital Improvements Program. The plan recommended "upgrading all three of the City's water treatment plants and expanding the capacity of two other treatment plants; service upgrades and repairs to pump stations and reservoirs; implementing state and federal mandated projects; increasing water conservation by five percent over current levels; and continuing the current water reclamation projects, including the North City Reclamation System, with the proposed repurification project."[13] The City Council approved a water revenue plan in 1997, along with a rate increase to support the recommended infrastructure improvements. In 1998, the city sold $383 million in water bonds.[14]

In addition, the San Diego County Water Authority (SDCWA), from which San Diego purchases much of its water, says it has a $1.2 billion capital improvement budget.[15]

San Diego earned "Threats to Source Water" ratings of 2 for its local water and 5 for its imported water.

San Diego relies on three major sources of drinking water. The City of San Diego Water Department uses surface water—storage reservoirs that capture rainwater—to supply 10 to 20 percent of the city's water. The city purchases the remaining 80 to 90 percent of its water from the Metropolitan Water District of Southern California (MWD). That water's primary source is the Colorado River, but some water also comes from the Sacramento-San Joaquin Delta in Northern California.

According to the EPA's Index of Watershed Indicators (IWI), the local San Diego watershed scored a 2 on a scale of 1 (least threat) to 6 (highest threat).[16] However, the

water San Diego imports from the Sacramento-San Joaquin Delta is under extreme stress from heavy upstream agricultural use, including heavy pesticide and herbicide applications, and is rated by EPA's IWI as a 5 out of 6, due to "more serious problems" with water quality.[17] The water can also contain significant levels of bromide and organic carbon, which react with disinfectants and can contribute to elevated levels of harmful disinfection byproducts. The lower Sacramento River is ranked by IWI as a 3[18] on the scale of 1 to 6, but as its water travels downstream it becomes increasingly threatened and earns the worst IWI rating of 6.[19] The other source of MWD water, the Colorado River, has problems of its own. By the time it reaches Lake Havasu it has traveled through a largely unprotected watershed past thousands of miles of farms, towns, and old mining sites. For example, the enormous uranium tailing piles in Moab, Utah, are leaking radioactive uranium and other contaminants into the Colorado,[20] and the river passes along the route of potential exposure from Yucca Mountain, the selected site for storage of the national repository for high-level radioactive waste.[21] On its trip, water in the Colorado becomes contaminated in Henderson, Nevada, with perchlorate in the Las Vegas Wash from the Kerr-McGee facility, which manufactured rocket fuel, and receives poorly treated wastewater discharges. The U.S. Geological Survey (USGS) notes that water quality problems in the Colorado River include pesticides from farms, nutrients, metals from historic mining (although these often adhere to sediments), and dissolved solids.[22] In addition, the Colorado River water is high in total dissolved solids, which can make reuse difficult and wreak havoc on plumbing and infrastructure.

KEY CONTAMINANTS FOUND ABOVE NATIONAL HEALTH GOALS

The following contaminants are found in San Diego's drinking water. For more information on their properties and health effects, see Chapter 2, "Health Concerns for Common Tap Water Contaminants."

MICROBIOLOGICAL CONTAMINANTS

Total Coliform Bacteria

Levels Found 1999[23]	Alvarado: 0.8%	Miramar: 0%	Otay: 0%
Levels Found 2000[24]	Alvarado: 1.22%	Miramar: 0.41%	Otay: 0.41%
Levels Found 2001[25]	Alvarado: 0.42%	Miramar: 0%	Otay: 0.41%

National Standard: 5%

National Health Goal: 0%—there is no known, fully safe level of coliform bacteria.

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

San Diego did not exceed the enforceable level for total coliform,[26] however, coliform bacteria were on occasion found in San Diego's water. As discussed in Chapter 2,

total coliform bacteria are microbial contaminants used as a potential indicator that disease-causing microbes may be present in tap water. The highest reported total coliform level in any month in San Diego was 1.2 percent. The federal standard allows up to 5 percent coliform-positive samples per month, so San Diego's coliform finding is not viewed as a serious health risk to healthy consumers. However, on at least one occasion (in March 1998), San Diego found *Cryptosporidium* and *Giardia* parasites in untreated source water coming into the Otay filtration plant.[27] In addition, San Diego's occasional identification of coliform bacteria in its distribution system is an indication that bacteria may regrow in the city's pipes.

INORGANIC CONTAMINANTS

Lead

Levels Found 1999: 5 ppb at 90th percentile, 1 site > EPA Action Level
Levels Found 2000–2001: Not reported[28] (Apparent violation of EPA rules to fail to report lead levels in 2000 and 2001 right-to-know reports)
National Standard (TT): 15 ppb (action level)

Please note that the standard (or action level) for measuring lead is different than those of other contaminants. Water utilities are required to take 50 samples of lead in the tap water distribution system. 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 considered a violation, and additional measures such as a treatment technique must be implemented.

National Health Goal (MCLG): 0 ppb—there is no known fully safe level of lead

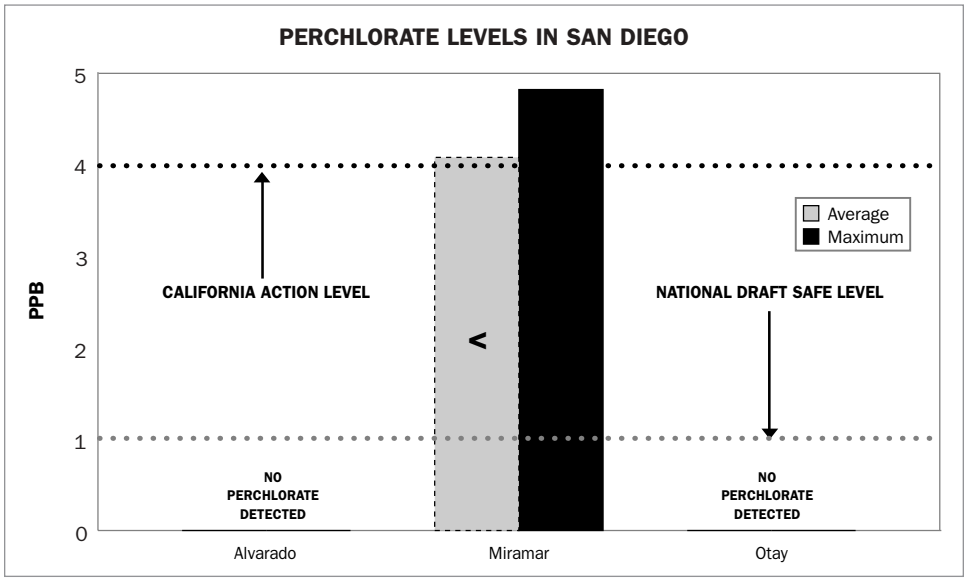
Lead is a major environmental threat; no amount of it in water is considered safe.[29] Infants, young children, and fetuses are particularly susceptible to the adverse health effects of lead. San Diego found no hazardous levels of lead in any of the homes it tested, but lead levels can vary enormously depending upon household plumbing. San Diego reports that its water is not corrosive and so is less likely to dissolve lead from plumbing fixtures than other cities' water. Lead pipe reportedly is not used in any of the city's water utility systems.

Perchlorate

Levels Found 2001[30]
Alvarado: not detected Miramar: <4.07 average, 4.81 ppb high Otay: not detected
National Standard (MCL): None established
National Draft Safe Level: (Drinking Water Equivalent Level): 1 ppb[31]
California Action Level: (health-based advisory level): 4 ppb[32]

Perchlorate[33] is an inorganic contaminant that harms the thyroid and may cause cancer. It usually comes from rocket fuel spills or leaks at military facilities.

San Diego's perchlorate levels of 4 to 4.8 parts per billion in part of the system are a health concern, based upon the state and federal EPA safety levels. It is troubling that San Diego, in issuing its 2001 right-to-know report published in June 2002, cited the outdated 18 parts per billion California action level, rather than the



updated 4 parts per billion California action level issued on January 18, 2002, five months before the San Diego report was issued.

ORGANIC CONTAMINANTS

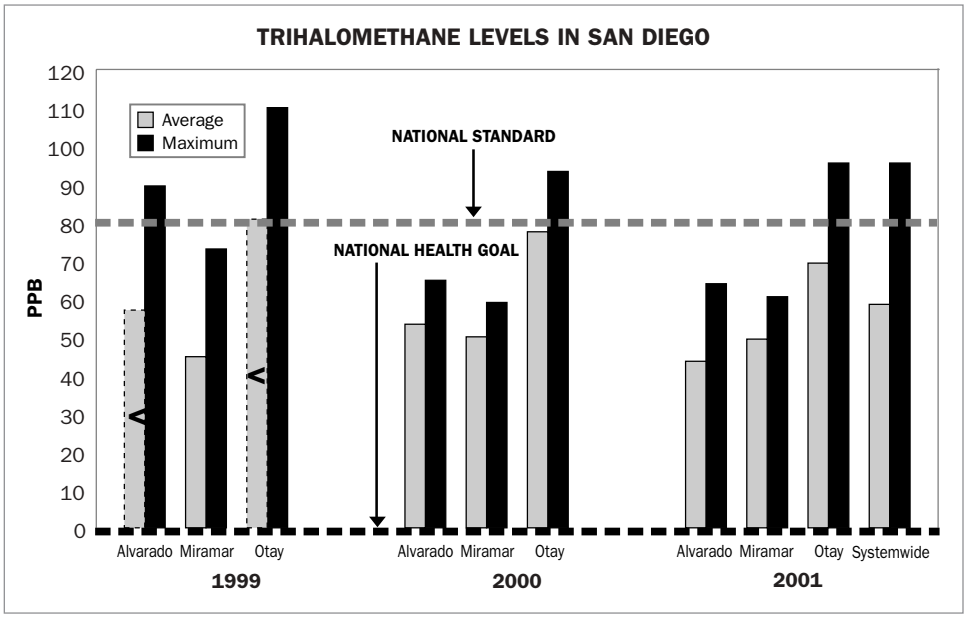
Total Trihalomethanes

Levels Found 1999[34]

Alvarado:	<57 average	89.5 maximum
Miramar	44.8 average	73.0 maximum
Otay	<80.8 average	110 maximum

Levels Found 2000[35]

Alvarado:	53.3 average	64.8 maximum



Miramar:	50.0 average	59.0 maximum
Otay:	77.5 average	93.3 maximum

Levels Found 2001[36]

System-wide	58.5 average	95.5 maximum
Alvarado	43.6 average	63.9 maximum
Miramar:	49.4 average	60.5 maximum
Otay	69.3 average	5.5 maximum

National Standard (MCL): 80 ppb (average) (effective 2002) (100 ppb effective through 2001))

National Health Goal (MCLG): 0 ppb—there is no known fully safe level of trihalomethanes.

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 zero. EPA promulgated and then withdrew (after a court decision) a zero 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 zero.

Total trihalomethanes[37] are chemical contaminants that result when chlorine used to treat drinking water interacts with organic matter in the water. Many studies show that these chemicals are linked with cancer, and the EPA has classified some TTHMs as probable human carcinogens. Recent preliminary studies also link TTHMs to miscarriages and birth defects. The levels in San Diego—averaging right at the new 80 ppb standard in 2000 and averaging somewhat less in 2001—are a concern, particularly with spike levels as high as 95.5 ppb in 2001.

Haloacetic Acids

Levels found 2000[38]

Alvarado	<24.9 ppb average	<27.5 ppb maximum
Miramar	<23.5 ppb average	<26.3 ppb maximum
Otay	<34.4 ppb average	<45.4 ppb maximum

Levels found 2001[39]

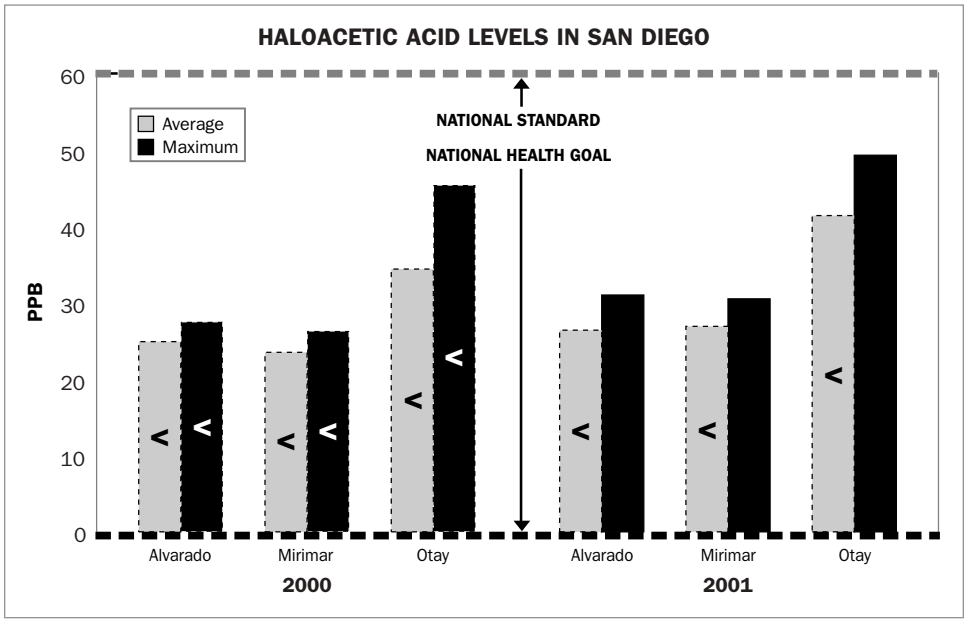
Alvarado	<26.4 ppb average	31 ppb maximum
Miramar	<26.9 ppb average	30.5 ppb maximum
Otay	<41.4 ppb average	49.3 ppb maximum

National Standard: 60 ppb (average) (effective 2002; no previous standard)

National Health Goal: 0 ppb—there is no known fully safe level of haloacetic acid

Some of the haloacetic acids have national health goals of zero and others have non-zero goals. For the purposes of consistency, we list the national health goal as zero because we list a single standard.

Haloacetic acids,[40] like TTHMs, are by-products of disinfection. People exposed to haloacetic acids in drinking water over a long term may be at risk of developing cancer and possibly other health problems.



Ethylene Dibromide (EDB)

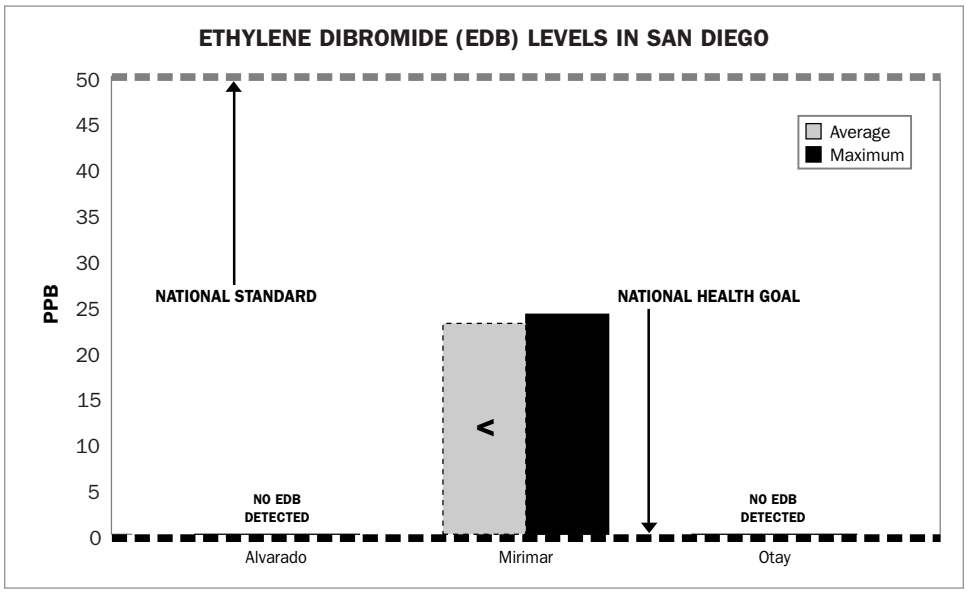
Levels Found 2002 (most recent data reported)[41]

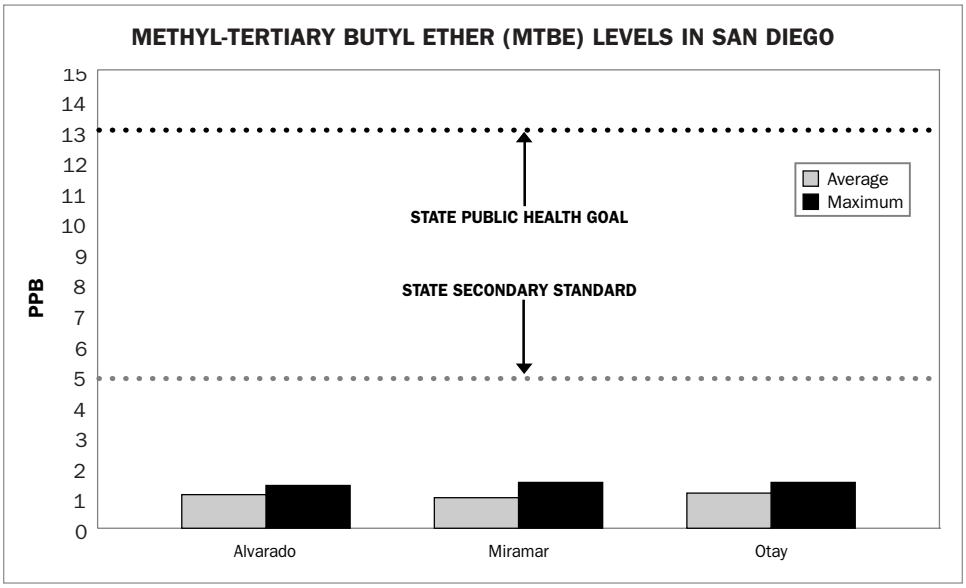
Alvarado	not detected	
Miramar	<23 ppt average	24 ppt high
Otay	not detected	

National Standard (MCL): 50 ppb (average)

National Health Goal (MCLG): 0 ppb—there is no known fully safe level of EDB.

Ethylene dibromide (EDB)[42] is a pesticide and industrial chemical found by the EPA to "potentially cause the following health effects when people are exposed to it at levels above the MCL for relatively short periods of time: damage to the liver, stomach, and adrenal glands, along with significant reproductive system toxicity,





particularly the testes."[43] The EPA also says that "EDB has the potential to cause the following effects from a lifetime exposure at levels above the MCL: damage to the respiratory system, nervous system, liver, heart, and kidneys; cancer."[44]

Methyl-Tertiary Butyl Ether (MTBE)

Levels Found 1999 (most recent data reported by San Diego)[45]

Alvarado	1.1 ppb average	1.4 ppb maximum
Miramar	1.0 ppb average	1.5 ppb maximum
Otay	1.15 ppb average	1.5 ppb maximum

Levels Found 2002 (reported by MWD for Skinner Plants, which serve San Diego)

	Non-detect average	1.3 ppb maximum

National or California Standard: none

National Health Goal (MCLG): none

EPA Health Advisory: 20–40 ppb (based on taste and odor concerns; the EPA says safe health level is higher)

California Secondary Standard (based on taste and odor problems): 5 ppb

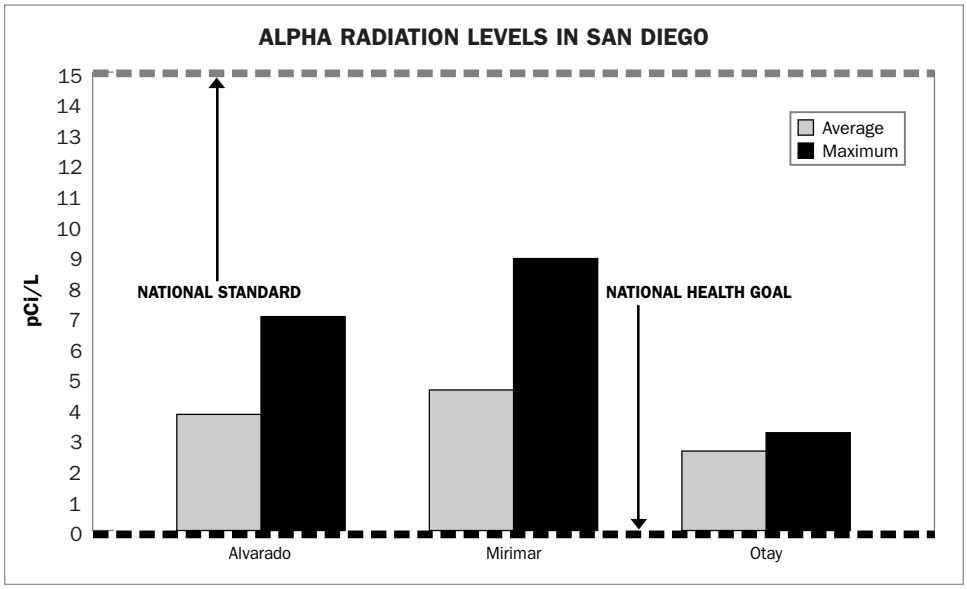
California Public Health Goal (based on cancer risk): 13 ppb[46]

Methyl-tertiary butyl ether[47] (MTBE) is a gasoline additive that gets into drinking water through discharges from chemical or petroleum factories, or from gasoline spills or leaks from underground or aboveground fuel storage tanks. It has been found in animal studies to cause testicular cancer, kidney cancer, lymphoma, and leukemia.

RADIOACTIVE CONTAMINANTS

Alpha Radiation

Levels Found 1998 (in picocuries per liter, or pCi/L, most recent data reported)[48]

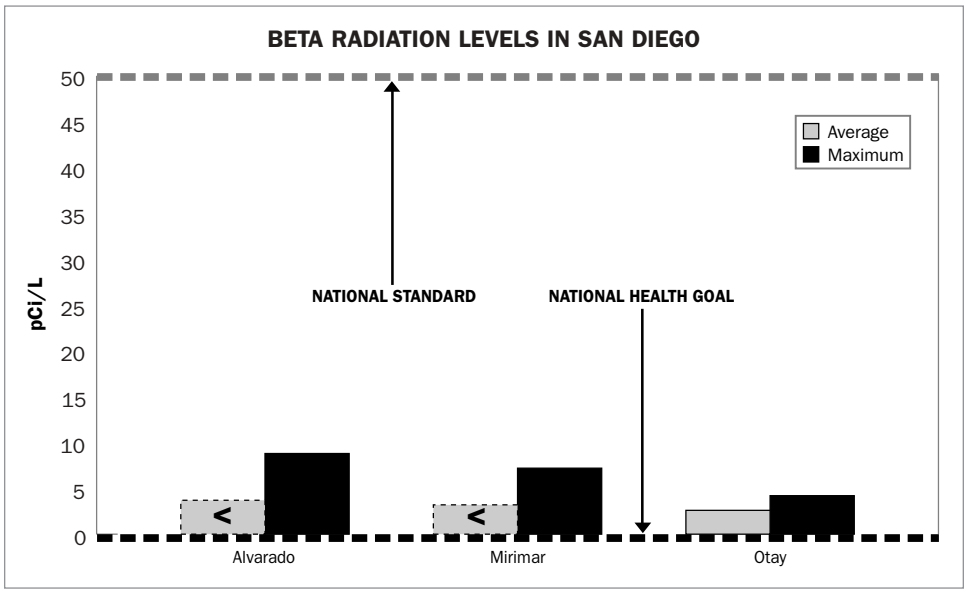


Alvarado	3.8 pCi/L average	7.0 pCi/L maximum
Miramar	4.6 pCi/L average	8.9 pCi/L maximum
Otay	2.6 pCi/L average	3.2 pCi/L maximum

National Standard (MCL): 15 pCi/L (average)

National Health Goal (MCLG): 0 ppb—there is no known fully safe level of alpha radiation

Alpha radiation is known to cause cancer. It usually results from the breakdown of natural radioactive elements in the ground. Because any level of exposure to gross alpha radiation can cause cancer, the EPA has set a health goal of zero for this radioactive contaminant. Thus, any exposure to this radioactive contaminant poses some cancer risk.



Beta Radiation

Levels Found 1998 (in picocuries per liter, or pCi/L, most recent data reported)[49]

Alvarado	<3.7 pCi/L average	8.8 pCi/L maximum
Miramar	<3.2 pCi/L average	7.2 pCi/L maximum
Otay	2.6 pCi/L average	4.2 pCi/L maximum

National Standard (MCL): 50 pCi/L (average)

National Health Goal (MCLG): 0 ppb—there is no known fully safe level of beta radiation

Gross beta particles are a form of radiation that can pollute drinking water when radioactive minerals in the environment erode, or as a result of mining or surface disturbances that may mobilize radioactive minerals. Gross beta radiation is a known human carcinogen. Because any level of exposure to gross beta radiation can cause cancer, EPA has set a health goal of zero for this radioactive contaminant. Thus, any exposure to this radioactive contaminant poses some cancer risk.

Uranium

Levels Found 1998 (in picocuries per liter, or pCi/L, most recent data reported)[50]

Alvarado	<1.4 pCi/L average	1.8 pCi/L maximum
Miramar	2.2 pCi/L average	2.5 pCi/L maximum
Otay	<0.8 pCi/L average	1.1 pCi/L maximum

National Standard (MCL): 30 mg/L (EPA assumes to be @30 pCi/L)

National Health Goal (MCLG): 0 ppb—there is no known fully safe level of uranium

California Standard: 20 pCi/L (average)

Uranium is a radioactive element that can pollute drinking water when radioactive uranium-containing minerals in the environment erode, or as a result of mining or surface disturbances that may mobilize radioactive minerals.[51] Uranium is a known human carcinogen, and it also causes damage to the kidneys. Because any level of radiation can cause cancer, EPA has set a health goal of zero for this radioactive contaminant. Thus, any exposure poses some cancer risk.

PROTECTING SAN DIEGO'S DRINKING WATER

Following are approaches to treating San Diego's drinking water, as well as a discussion of threats to source water. Also included in this section is information on how individuals can protect drinking water.

TREATMENT OPTIONS AVAILABLE FOR CONTAMINANTS OF GREATEST CONCERN

Treatment to Reduce Disinfection Byproducts (Such as Trihalomethanes and Haloacetic Acids). By comparison to other cities that use surface water, San Diego's disinfection by-product levels are high and should be reduced with additional treatment. For example, enhanced coagulation, activated carbon, and/or the use of an alternative primary disinfectant such as ozone or ultraviolet light could reduce by-product levels further. In addition, San Diego has found *Cryptosporidium* and *Giardia* parasites in untreated source water coming into the Otay filtration plant.[52] Although

San Diego claims it has never found viable *Cryptosporidium* in its *finished* drinking water (*Crypto* generally is impossible to find in finished water for methodological reasons), ozone or ultraviolet light would offer a measure of additional assurance against *Crypto.* These disinfection technologies are far more effective at killing *Crypto* and certain other resistant parasites than is San Diego's current choice, chlorine. The use of ozone may, however, be somewhat limited if San Diego uses its water sources with high bromine water because high bromine water creates bromate at elevated levels when ozonated.

CURRENT AND FUTURE THREATS TO SOURCE WATER

San Diego has not yet completed the source water assessment that must be done by 2003, but has finished a "Watershed Sanitary Survey," which is available from the water department by calling (619) 527-3121. Some of the watersheds relied upon by the city are known to be susceptible to such problems as cattle and other grazing animals, urban runoff, wastewater collection systems and discharges, concentrated animal facilities, human residential and recreational use, and agricultural and industrial use.

Three water treatment plants serve the City of San Diego. South San Diego gets water from the Otay Filtration Plant, central San Diego's water comes from the Alvarado Filtration Plant located at Lake Murray, and north San Diego gets water from the Miramar Filtration Plant.[53] About 80 to 90 percent of San Diego's water is purchased from the Metropolitan Water District of Southern California,[54] the largest wholesaler of water in the state.

Colorado River Water. In 2001, most of the city's water—about two-thirds of SDCWA water[55]—was purchased from MWD's Colorado River system. Colorado River water travels through a largely unprotected watershed past thousands of miles of farms, towns, and historical mining sites. The Colorado receives water containing substantial concentrations of the rocket fuel perchlorate in Nevada from the Las Vegas Wash, which is contaminated by a leaking waste area at a Kerr-McGee plant in Henderson, Nevada, and also receives contaminants from urbanized areas, including poorly treated wastewater discharges and runoff. Uranium tailing piles in Moab, Utah, are the size of 118 football fields, making them the largest tailings pile situated on the banks of a river, situated as they are just 750 feet from the Colorado River and 10 feet above the aquifer, according to data collected by the Project on Government Oversight (POGO).[56] The tailings piles contain about 10.5 million tons of uranium mill wastes including 426 million gallons of highly contaminated liquid.[57] The uranium tailing contaminant leakage into the Colorado River is estimated at 9,648 gallons per day. Radioactive uranium, ammonia, molybdenum, aluminum, iron, nitrates, and sulfates from the tailings site are contaminating groundwater that feeds into the Colorado River.[58] The river also has flooded 26 times this century to the level of the tailings.[59] In addition, the Colorado passes along the route of potential exposure from Yucca Mountain, the selected site for storage of the national repository for high level radioactive waste.[60]

The U.S. Geological Survey (USGS) notes that water quality problems in the Colorado River include pesticides from farms, nutrients, metals from historic mining (although these often adhere to sediments), and dissolved solids.[61] USGS reports that the "salinity of the Colorado River probably is the biggest water-quality issue in the basin. The major sources of salinity are the saline soils of the Colorado Plateau and agricultural irrigation-return flows. . . . Urbanization, population growth, mining, agricultural practices, and recreation affect the salinity concentrations in the Colorado River."[62]

The Colorado River's elevated levels of total dissolved solids (salinity) make reuse difficult and wreak havoc on plumbing and infrastructure. Because of this problem, San Diego officials have sought more water from other, cleaner sources (such as from the Sacramento-San Joaquin Delta, see below) to mix with saltier Colorado River water. Estimates are that the Colorado River water carries 9 million tons of salt to Southern California's local surface and groundwater sources each year.[63] Most of the urbanizing watersheds in San Diego County (*e.g.* the San Diego River watershed) are already listed as impaired because of excessive total dissolved solids (salt), which also adversely affect groundwater quality.[64]

The SDCWA recently reached a water transfer agreement with the Imperial Irrigation District. The agreement is expected to go into force in 2003 with a delivery of 20,000 acre-feet of water. By 2012, the transfer will bring up to 200,000 acre-feet of Colorado River water annually to the SDCWA's service area.[65]

Sacramento–San Joaquin Delta Water from Northern California. The rest of San Diego's MWD water, about a quarter of San Diego County Water Authority water in 2001, was imported via the "State Water Project," which comes from the Sacramento-San Joaquin Delta in Northern California.[66] The San Joaquin Delta earned a 5 rating by EPA's IWI, on a scale of 1 (best) to 6 (worst).[67] An NRDC report concludes that the Delta area ecosystem and water quality are severely threatened.[68] And, according to a review of Delta water quality by the state-federal agency CALFED, the contaminants in Delta waters of "most concern with respect to the production of drinking water include microbial pathogens, bromide, natural organic matter, dissolved solids, salinity, turbidity, and nutrients. Some other contaminants of Delta waters, including pesticides, metals, and methyl tertiary-butyl ether (MTBE), were evaluated and considered to be of limited significance to drinking water at this time because of their relatively low concentrations in Delta waters."[69] This relatively sanguine view of pesticides, metals, and gasoline constituents in Delta waters may change as additional data become available and more pollution sources are located in the watersheds.

Local Water Sources. Finally, about 10 to 20 percent of the city's water supply is made up of local rainfall captured in reservoirs.[70] EPA's Index of Watershed Indicators (IWI) ranks the local San Diego watershed as a 2 out of 6 (1 is least threat; 6 is highest threat). In EPA's words, "The overall IWI score. . . describes the health of the aquatic resources for this watershed. A score of 2 indicates Better Water Quality (few problems with watershed condition), High Vulnerability to stressors such as pollutant

Figure 1
Imported Sources of Water for San Diego and Southern California

Source: Metropolitan Water District of Southern California, 2002

loadings (due to significant pollution and high vulnerability to declines in aquatic health)."[71] Generally, locally produced water is of relatively high quality, but urban sprawl and polluted runoff, coupled with salinity from imported water sources, threatens local potable water quality.[72] Unfortunately, San Diego County does little or nothing to coordinate land use planning and source water protection, posing a significant threat to future use of local water resources.[73]

The City of San Diego is evaluating a 3,800 acre-feet per year groundwater recharge and recovery program in the San Pasqual basin.[74] Other alternatives that have been proposed include using Pueblo water rights for the city. In addition, many other localities served by the San Diego County Water Authority (SDCWA) are currently using groundwater; some jurisdictions now recharge or plan to recharge groundwater with "reclaimed water"—that is, treated municipal wastewater.[75] Such projects have sometimes been highly controversial, due in part to concerns about water quality and the safety of relying upon such water for drinking. In addition, parts of the SDCWA service area are already using or seriously evaluating the use of reverse osmosis treatment to desalinate salty water for use as a drinking water source. Recently, the SDCWA board decided to initiate a study of seawater desalination as a possible additional way to diversify the county's water supplies.[76]

The SDCWA and others locally have promoted water-conserving plumbing fixtures, appliances, landscaping, and agricultural irrigation systems. According

to the SDCWA, per capita water use in the county is now 13 percent less than it was in 1990.[77]

HOW INDIVIDUALS CAN PROTECT SOURCE WATER

You can take steps to protect San Diego's drinking water by protecting its sources.

Reduce the amount of water you use. Plant drought-resistant plants or "xeriscape" (use plants that need little or no watering), use low-flow shower-heads, shorten your shower time, don't spray down your driveway to clean it, minimize the number of times (and how long) you water your lawn. Consider installing low-flush toilets. Recycled wastewater can be used for landscaping and industrial applications. You can even get a voucher for an ultra-low-flush toilet in San Diego. See the City Water Department's excellent website on water conservation at www.sandiego.gov/water/conservation/consprogram.shtml for details.

For more tips on water conservation, see:
- www.monolake.org
- www.mwdh2o.com/mwdh2o/pages/conserv/save/tentips/tentips01.html

Get a *free* water conservation survey for your San Diego home conducted by the Water Department. A Water Conservation representative will tour your property to identify leaks and water-saving opportunities. The representative will even give you low-flow showerheads, faucet aerators, and other free items! The representative will evaluate your landscape and irrigation systems. For a free water survey, call the City of San Diego Water Conservation Hotline at (619) 515-3500 or E-mail them at water@sandiego.gov.

Avoid using pesticides in the home or yard, or storing pesticides in the home. Consumer pesticide use in the home leads to runoff into water resources.

Buy organic foods, if possible. Purchasing organically grown food helps prevent the drinking water source contamination from pesticide and herbicide runoff that results from conventional agricultural practices.

Attend meetings of the City of San Diego Water Department (info below), and the San Diego County Water Authority, (828) 522-6700, (www.sdcwa.org). Ask for dates, times, and locations.

Attend meetings of your local water supplier, the City of Fresno Department of Public Utilities—Water Division. Check the right-to-know report or call and ask for dates, times, and locations. (Contact information above.)

F**ind out what watershed you live in and contact the San Diego stormwater pollution prevention program for information on how to reduce stormwater pollution.** Check out

SAN DIEGO WATER UTILITY INFORMATION

City of San Diego Water Department
Operations Division 2797
Caminito Chollas, MS 43
San Diego, CA 92105-5097
(619) 527-3121
www.sandiego.gov/water
www.thinkbluesd.org

the "Think Blue San Diego" website for tips on how to reduce storm water pollution at www.thinkbluesd.org.

Learn more from these groups:

- Clean Water Action, www.cleanwater.org
- NRDC, www.nrdc.org
- Environmental Health Coalition, www.environmentalhealth.org
- Mono Lake Committee, www.monolake.org
- WaterKeepers Northern California, www.sfbaykeeper.org
- CALPIRG, www.calpirg.org
- Clean Water Network, www.cwn.org

NOTES

1 Peer Reviewers for the San Diego report included Suzanne Michel, San Diego State University, and Marguerite Young, California Clean Water Action.

2 The City of San Diego, Water Department, Consumer Confidence Report 2001, available online at www.sandiego.gov/water/quality/index.shtml or www.sannet.gov/water/quality/report01.pdf.

3 See EPA Proposed Stage I Disinfection Byproducts Rule, 59 Fed. Reg. 38668, July 29, 1994.

4 See EPA Final Stage I Disinfection Byproducts Rule, 63 Fed. Reg. 69389, December 16, 1998.

5 See 40 C.F.R. § 141.153(d)(4)(vi).

6 The City of San Diego, Water Department, "Consumer Confidence Report 1999," available online at www.sannet.gov/water/quality/report99.pdf .

7 Testing reported in online file at www.sandiego.gov/water/quality/monthly.pdf.

8 See 40 C.F.R. §141.153(d)(4).

9 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 EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution, where the water system is aware of the pollution source, the rules require that polluter to be identified.

10 See, for example, MWD—Southern California's online fact sheet on perchlorate, mentioning Nevada source of perchlorate, a fact not mentioned by San Diego. See www.mwd.dst.ca.us/mwdh2o/pages/yourwater/ccr02/ccr03.html.

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

12 Ibid.

13 City of San Diego Water Department, Infrastructure and Capital Improvements, fact sheet available online at www.sandiego.gov/water/cip/background.shtml.

14 Ibid.

15 See San Diego County Water Authority: An Overview (fact sheet), July 2002, available online at www.sdcwa.org/about/sdcwa-overview-2002.pdf.

16 EPA Index of Watershed Indicators, at www.epa.gov/iwi/hucs/18070304/score.html (last visited 3/31/02).

17 EPA, IWI, for the San Joaquin Delta is available online at www.epa.gov/iwi/hucs/18040003/score.html.

18 See EPA, IWI at www.epa.gov/iwi/hucs/18020109/score.html.

19 Ibid.

20 See POGO, "Moab Utah Uranium Mill Tailings Fact Sheet," available online at www.pogo.org/p/environment/eo-000507-moab.htm.

21 See State of Nevada, *Mountain of Trouble: A Nation at Risk*, (2002), outlining risks to local hydrology from Yucca Mountain high-level waste depository and from transportation of waste to the site.

22 USGS, "Water Quality in the Upper Colorado River Basin, 1996-1998, available online at http://water.usgs.gov/pubs/circ/circ1214/; USGS, "Monitoring the Quality of the Nation's Largest Rivers: The Colorado River NASQAN Program," available online at http://water.usgs.gov/nasqan/progdocs/factsheets/clrdfact/clrdfact.html.

23 See note 6.

24 Ibid.

25 See note 7.

26 The information on health effects of coliform is derived from EPA, "Total Coliform Rule," 54 Fed.Reg. 27544-27568, June 29, 1989, and EPA, "Total Coliform Rule: A Quick Reference Guide" available online at *Total Coliform Rule: A Quick Reference Guide* PDF File 816-F-01-035, September 2001.

27 EPA, ICR Data for San Diego Water Department, available online at www.epa.gov/enviro/html/icr/utility/report/CA3710020960610083945.html.

28 The City of San Diego, Water Department, "Consumer Confidence Report 2000," available online at www.sannet.gov/water/quality/report00.pdf (last visited April 1, 2002).

29 See EPA, "Consumer Fact Sheets on Lead," www.epa.gov/safewater/Pubs/lead1.html and www.epa.gov/safewater/standard/lead&co1.html; IRIS summary for lead online at www.epa.gov/iris/subst/0277.htm.

30 See note 2.

31 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 http://www.epa.gov/safewater/ccl/perchlor/perchlo.html.

32 See California Department of Health Services, "Drinking Water Action Level for Perchlorate," available online at www.dhs.ca.gov/ps/ddwem/chemicals/perchl/actionlevel.htm.

33 California Office of Environmental Health Assessment, "Draft Public Health Goal for Perchlorate in Drinking Water," March 2002, available online at www.oehha.org/water/phg/pdf/PHGperchlorate372002.pdf.

34 See note 6.

35 See note 28.

36 See note 30.

37 Health effects information on disinfection byproducts is summarized from NRDC, *Trouble on Tap* (1995); NRDC, *Bottled Water: Pure Drink or Pure Hype?* (1999), available online at www.nrdc.org/water/drinking/bw/bwinx.asp; and EPA, draft Preamble for Stage 2 Disinfection By-products Regulation, available online at www.epa.gov/safewater/mdbp/st2dis-preamble.pdf.

38 See note 28.

39 See note 2.

40 See note 37.

41 See note 28.

42 This EDB health and use information derived from EPA, "Consumer Fact Sheet on Ethylene Dibromide," (available online at www.epa.gov/safewater/dwh/c-soc/ethylene.html).

43 Ibid.

44 Ibid.

45 See note 6.

46 California OEHHA, MTBE Public Health Goal, 1999, available online at www.oehha.ca.gov/water/phg/pdf/mtbe_f.pdf.

47 Ibid.

48 See note 2.

49 Ibid.

50 Ibid.

51 For further information, see EPA's Final Rule for Uranium and other radionuclides at 65 Fed. Reg. 76708, December 7, 2000, available online at www.epa.gov/safewater/rads/radfr.pdf.

52 EPA, ICR Data for San Diego Water Department, available online at www.epa.gov/enviro/html/icr/utility/report/CA3710020960610083945.html.

53 www.sannet.gov/water/quality/#a.

54 See note 2.

55 See San Diego County Water Authority: An Overview (fact sheet), July 2002, available online at www.sdcwa.org/about/sdcwa-overview-2002.pdf.

56 See POGO, "Moab Utah Uranium Mill Tailings Fact Sheet," available online at www.pogo.org/p/environment/eo-000507-moab.htm.

57 Ibid.

58 Ibid.

59 Ibid.

60 See State of Nevada, *Mountain of Trouble: A Nation at Risk*, (2002) (outlining risks to local hydrology from Yucca Mountain high-level waste depository and from transportation of waste to the site).

61 USGS, "Water Quality in the Upper Colorado River Basin, 1996–1998," available online at http://water.usgs.gov/pubs/circ/circ1214/; USGS, "Monitoring the Quality of the Nation's Largest Rivers: The Colorado River NASQAN Program," available online at http://water.usgs.gov/nasqan/progdocs/factsheets/clrdfact/clrdfact.html.

62 USGS, "Monitoring the Quality of the Nation's Largest Rivers: The Colorado River NASQAN Program," available online at http://water.usgs.gov/nasqan/progdocs/factsheets/clrdfact/clrdfact.html.

63 Personal Communication with Suzanne Michel, San Diego State University, June 18, 2002, citing Newcomb, Josh, "Getting Serious About Salt: Urban Water Purveyors Seek Solution to Mounting Problem," *Western Water*. Sacramento, CA., Water Education Foundation, September/October 1999.

64 Ibid.

65 See San Diego County Water Authority: An Overview (fact sheet), July 2002, available online at www.sdcwa.org/about/sdcwa-overview-2002.pdf.

66 San Diego website, www.sannet.gov/water/quality/#a.

67 EPA, IWI, for the San Joaquin Delta is available online at www.epa.gov/iwi/hucs/18040003/score.html.

68 See www.nrdc.org/water/conservation/cabay/fcabay.asp.

69 CALFED, *Water Quality Program Plan*, July 2000, pp. 3–5.

70 See note 7.

71 EPA Index of Watershed Indicators, at www.epa.gov/iwi/hucs/18070304/score.html (last visited March 31, 2002.

72 Personal Communication with Suzanne Michel, San Diego State University, June 18, 2002.

73 Ibid.

74 See San Diego County Water Authority Groundwater Study (1999), available online at www.sdcwa.org/manage/groundwater-exec-summary.phtml.

75 Ibid.

76 Ibid.

77 See San Diego County Water Authority: An Overview (fact sheet), July 2002, available online at www.sdcwa.org/about/sdcwa-overview-2002.pdf.