ARSENIC IN CALIFORNIA DRINKING WATER

Three Years After EPA Notice of Noncompliance to State, Arsenic Levels Still Unsafe in Drinking Water for 55,000 Californians

ENVIRONMENTAL INTEGRITY PROJECT

SEPTEMBER, 2016

ACKNOWLEDGEMENTS

This report was researched and written by Tom Pelton, Courtney Bernhardt, and Eric Schaeffer of the Environmental Integrity Project. The map was created by Kira Burkhart and the graphics by Alana Natke.

THE ENVIRONMENTAL INTEGRITY PROJECT

The Environmental Integrity Project (http://www.environmentalintegrity.org) is a nonpartisan, nonprofit organization established in March of 2002 by former EPA enforcement attorneys to advocate for effective enforcement of environmental laws. EIP has three goals: 1) to provide objective analyses of how the failure to enforce or implement environmental laws increases pollution and affects public health; 2) to hold federal and state agencies, as well as individual corporations, accountable for failing to enforce or comply with environmental laws; and 3) to help local communities obtain the protection of environmental laws.

For questions about this report, please contact EIP Director of Communications
Tom Pelton at (202) 888-2703 or
tpelton@environmentalintegrity.org.

PHOTO CREDITS

Cover and rear photos purchased from iStockphoto

Arsenic in California Drinking Water

More than three years after the U.S. Environmental Protection Agency found California in noncompliance with the federal Safe Drinking Water Act, 95 community water systems in the state, serving more than 55,000 people, are still providing water with illegal levels of arsenic, according to an examination of state data for the last two years.[1] Arsenic occurs naturally in the soil and groundwater in parts of California and is a known carcinogen that may also damage the developing brains of children and cause other health problems.[2] Many of the people drinking excessive levels of arsenic are poor and/or Latino or African-American, with a cluster in the San Joaquin Valley.[3] More than 80 percent have been exposed to excessive arsenic levels for at least five years and probably longer.[4]

California requires public water systems to notify their customers when arsenic fails to meet federal health standards. But strangely, the state's language for mailed advisories suggests the water is still safe to drink no matter how high the contimation levels or how long they persist, with the notices telling residents: "You do not need to use an alternative water supply (e.g., bottled water)." [5] That advice conflics with what California tells private well owners (who aren't covered by federal standards) on a state website: "If you suspect that your well may have arsenic, you should not use the water until it is tested, and you take appropriate measures to protect yourself and your family from potential chronic health effects if arsenic is present."[6] Whatever the intention, California's language for people on public water systems is likely to encourage them to drink contaminated water. (For the full text of the California's language, see Appendix A). As the state continues a multi-year effort to solve the contamination problem, it should immediately fix a communications problem so that it clearly warns people not to drink arsenic-tainted tap water.

The highest levels of arsenic in drinking water in California from 2011 through 2015 were in a group home for troubled teenage boys, the Valley Teen Ranch in Madera County. About 50 boys assigned by the courts to the facility have been living in a home with water that has arsenic at concentrations averaging more than 12 times the federal limit (10 parts per billion, or ppb) over these five years, according to state records.[7] "Nobody wants to drink the water because it's brown and nasty,"said Connie R. Clendenan, CEO of the nonprofit organization that runs the group home.[8] "It looks bad."

It is bad. Although California has made substantial progress in addressing

drinking water problems, the state still has 13 school districts, serving a total of 8,822 students, with arsenic in their drinking water that exceeded the federal limit from 2011 to 2015.[9] Twelve mobile home parks in California, serving 889 people, had arsenic in their tap water that averaged up to five times the legal limit. The average annual concentrations of arsenic in the drinking water of 58 residential communities (other than trailer parks) exceeded the legal limit during this time period, as did a military base, three wineries, two food preparation businesses and two campgrounds.

In many of the schools, the group home and military base, administrators say they verbally warn people not to drink tap water. They also provide bottled water as an alternative. But in the residential neighborhoods and trailer parks, it is not clear what warning – if any -- people are receiving. "There is no warning not to drink it. There is no 'non-drink' order out there," said Robert Johnson, President of the Shaver Lake Point 2 Mutual Water Company, which supplies 210 homes in Fresno County with tap water that has seven times the legal limit of arsenic. When asked if these residents should drink bottled water instead of his arsenic-tainted tap water, Johnson said: "It's one of those things, if you want to do it, that's your deal. It's not being recommended. We're not suggesting it. This is per the state of California. We are following their guidance."

The drinking water crisis in Flint, Michigan, was a reminder of how important it is for state governments to issue clear warnings to people with unhealthy tap water. California's mixed message is nearly identical to the one issued by Texas to homeowners with illegal levels of arsenic in their drinking water. Texas also tells consumers with excessive levels of arsenic: "You do not need an alternative water supply."[10] Many other states, however, are more direct in warning people not to drink water with excessive amounts of arsenic, at least for private well owners. Wisconsin, Michigan, Maine, and Washington, for example, simply tell residents not to consume water with more than 10 ppb arsenic (a health standard set by EPA in 2001). Wisconsin advises private well owners: "If your arsenic level is more than 10 ppb, the Wisconsin Department of Health Services recommends that you stop using your water for drinking or food preparation."[11] Florida advises its consumers to avoid water where arsenic contamination persists.[12] The U.S. Department of Health and Human Services makes similar recommendations.[13] If anything, the most recent science suggests that the current 10 ppb arsenic standard is not protective enough and that the IQ of children may be damaged at much lower exposures.[14]

In the wake of a 2013 EPA notice of noncompliance to California over its failure to invest enough money in its drinking water systems, the state has taken several important steps to fix its problems. Over the last three years, the state has more than doubled the amount of funding to build water treatment plants, pipelines, and new wells. The state and counties have filed compliance orders with local utilities to push them to upgrade their systems and are directing small, underfunded water systems to merge with larger utilities. Because of these measures, EPA announced in May 2016 that California was back in compliance with the federal Safe Drinking Water Act.

But in fact, the work is far from done – as witnessed by the 55,985 people in 95 communities across California who still have illegal levels of the carcinogen in their tap water, according to state records.[15] Why the delays? Local officials say that in some cases, bureaucratic

negotiations are holding up projects, which are sometimes stalled because of conflicts between county and state rules. In other cases, local water districts struggle with indecision or a lack of money.

Until these important water system improvements are complete, California and EPA must do a better job of warning consumers to stop drinking water that fails federal health standards. This report recommends:

- California and EPA should revise their regulations and guidance to require that local utilities warn people to stop drinking or cooking with water that fails to meet federal arsenic standards (10 ppb), especially when the contamination persists over several years. The advice should be sensitive to the additional risks posed when children and other sensitive populations drink contaminated water. If there is no reason for consumers to take precautions, there is no reason for Safe Drinking Water Act standards in the first place.

- Public notices mailed to consumers should inform them of options for treating contaminated water at home, e.g., through filtration systems that have proven to be effective. Conversely, the public should be told what doesn't work. For example, boiling water will not reduce arsenic concentrations.

- Federal and state authorities should provide enough money to these 95 California communities to allow them to install water filtration systems or take other steps to eliminate contamination problems. Although the state has already boosted its funding, it still faces a projected $30 billion plus in needed capital improvement projects to help its inadequate systems provide safe drinking water trough 2026.[16]

The big picture is that stepped-up investment in crumbling public infrastructure is sorely needed across the U.S., and it should be regarded as a top priority for both Congress and California lawmakers. But the state also needs to improve its efforts to better inform consumers so people can protect their own health. California does not have to wait for EPA action to strengthen its warnings because the state is already empowered to act independently of EPA.

Public health advisories that are contradictory and confusing – as they are in California -- are as bad as no warnings at all, because they undermine action and weaken public confidence in government.

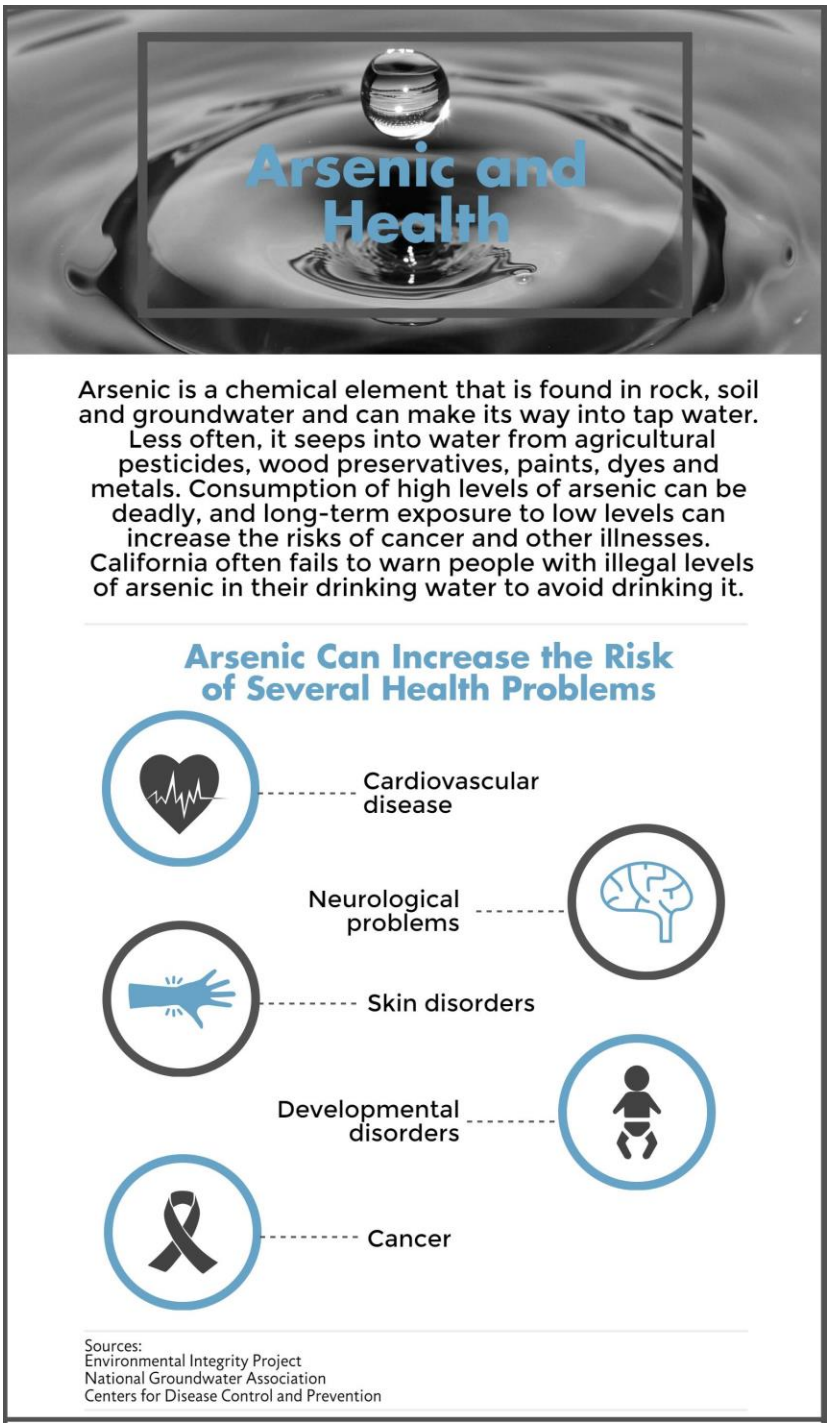
Table 1. Top 20 Arsenic Concentrations in California Public Water Systems

Water System (in Order of Arsenic Levels)	County	Pop. Served	2014-2015 avg (ppb)	2011-2015 avg (ppb)
Lakeview Improvement Association #1	Fresno	160	86.88	86.88*
Fountain Trailer Park Water	Kern	68	85.75	83.90
Hungry Gulch Water System	Kern	33	72.56	70.04
Corral De Tierra Estates WC	Monterey	45	72.50	78.40
Keeler Community Service District	Inyo	50	71.25	75.63
Quail Valley Water District- Eastside System	Kern	60	70.06	69.11
CSA 70 W-4 Pioneertown	San Bernardino	625	64.52	61.55
MD #06 Lake Shore Park	Madera	130	64.25	71.94
Valley Teen Ranch	Madera	50	62.00	120.80
Sierra East Mobile Home Community	Mono	50	54.63	47.03*
Shaver Lake Point #2	Fresno	210	52.31	42.88*
Winterhaven Mobile Estates	Los Angeles	40	52.13	53.35
Olam Spices And Vegetables Inc.	Kings	75	48.38	46.70
The Village Mobile Home Park	Los Angeles	70	45.05	47.04
Callier Water System	San Bernardino	1000	42.13	49.21*
Black Stallion Winery	Napa	25	41.75*	41.75*
Ironwood Camp	San Bernardino	1000	38.38	38.55
Boron CSD	Kern	2500	38.07	37.98
Edgewater Mobile Home Park	Sacramento	40	38.00	37.59
Prunedale MWC	Monterey	252	35.7	32.0

Note: The federal limit for arsenic is 10 ppb. * Average concentrations do not include concentrations from every year. For example, Lakeview Improvement Assn. #1 changed from a non-community water system to a community water system in 2013, and sampling data was only available from 2014 and 2015. Sampling results for Black Stallion Winery were only available for 2015. See Appendix B for annual concentrations in all systems that averaged above 10 ppb.

Health Risks Posed by Arsenic

Arsenic is a chemical element that occurs naturally in geological formations in California and elsewhere, and is also used in a variety of industrial products, including pesticides, paint, and wood preservatives.[17] It is a well-known poison at high doses. At lower doses, researchers have concluded it can cause cancers of the lung, kidney, bladder, skin, and other



organs with prolonged exposure. Any level of exposure, however, carries some risk.[18] According to EPA, the risk of developing cancer after drinking water containing 10 ppb arsenic over a lifetime is 1 in 2,000.[19] This level of risk is almost never 'acceptable' from a regulatory perspective. The agency usually tries to limit lifetime cancer risk to no more than 1 in 10,000, at most. EPA's risk estimate assumes that the cancer risk is linear, meaning if water contains 20 ppb arsenic, those who drink it over a long period of time have a 1 in 1,000 chance of developing cancer. People exposed over shorter periods of time have lower risks, but exposure during childhood may have a greater impact than exposure during adulthood.[20]

Morever, these risk calculations reflected the old thinking. New evidence suggests that the actual cancer risk may be much higher. EPA is currently revising its assessment of cancer risks from arsenic to incorporate more recent science. A 2010 draft of the assessment indicated that the risk of getting cancer from drinking water containing 10 ppb of arsenic is closer to 1 in 136, more than 17 times higher than current assumptions.[21] In addition to causing cancer, arsenic is also a neurotoxin that can harm developing brains at levels at or below the allowable limit.[22] One recent study in Maine, for example, found significant reductions in IQ and other problems in children exposed to arsenic concentrations of 5 to 10 ppb.[23] Specifically, children in homes with more than 5 ppb arsenic in the tap water tested roughly 6 points lower on a full-scale IQ test.[24] While EPA's

Scientific Advisory Board and the most recent studies suggest that the 'safe' level of arsenic is likely much lower than 10 ppb, any concentration higher than 10 is clearly unsafe.

Background on California's Problem

On April 19, 2013, EPA sent a letter to the California Department of Public Health notifying the state that it was out of compliance with the federal Safe Drinking Water Act.[25] The reason was that California's drinking water system was inadequate – providing contaminated water in many poor, rural communities – and the state was not investing enough money to fix the problem. A state investigation that year revealed that 680 community water systems serving 21 million people relied on groundwater that was compromised by one or more contaminants, with the most common being arsenic.[26]

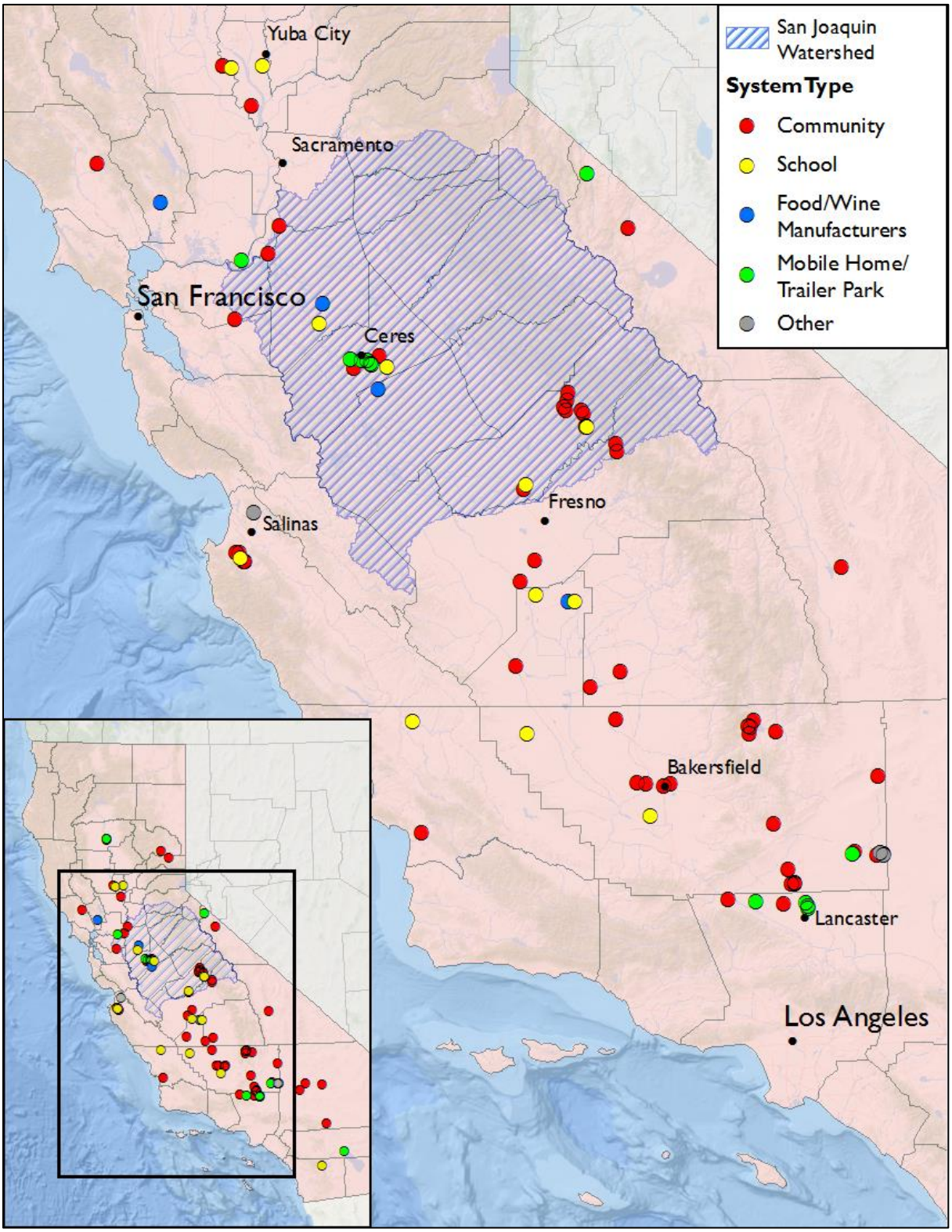
Not all of these 680 water systems provided tap water that had levels of contaminants in excess of federal health standards. In most wealthier and urban communities, the local water utilities treated the groundwater or diluted it with clean water from other wells so that it met the requirements of the federal Safe Drinking Water Act. But in 265 of these communities – often with small populations in rural, isolated areas – the tap water provided to customers had at least one violation of federal standards from 2002 to 2010 for a variety of contaminants, including nitrates from farm fertilizer, according to a 2013 report by the California Department of Health.[27]

In a separate study, researchers at the University of California, Berkeley, examined 464 community water systems serving 1.1 million people in California's San Joaquin Valley, one of the poorest regions in the state, and found that 15 percent of the systems and 14 percent of the people had tap water with arsenic above the federal limit.[28] Of the people exposed, 61 percent were either Latino or African-American. "Community water systems serving higher percentages of people of color had a 260 percent higher chance of having at least one (arsenic) violation," researcher Dr. Carolina L. Balazs and colleagues wrote.[29]

In response to the chronic drinking water problem, Congress had approved $1.5 billion to California over a decade to upgrade its water systems through a program called the Safe Drinking Water State Revolving Fund.[30] Yet because of bureaucratic obstacles and inefficiencies, the state by 2013 had not spent $455 million of those funds – the largest unspent balance of any state. According to EPA's 2013 letter of noncompliance to the California Department of Health, this violated a federal requirement that the state "make *timely* loan or grants using *all available* drinking water funds."[31]

EPA ordered the state to accelerate its efforts to fix public water systems. California Governor Jerry Brown's administration took action in several steps. These included switching control of the state's drinking water program from the Department of Health (where policy focus was dispersed among numerous problems, including drug abuse and AIDS), to the California State Water Resources Control Board (whose only focus is water) under the California Environmental Protection Agency. Since the EPA issued its

Map 1. Public Water Systems with Illegal Levels of Arsenic, 2014-2015



2013 letter of noncompliance, the state has more than doubled the amount of money it is distributing for water system upgrade projects, to an average of $738 million per year, compared to $366 million per year in the period of 2008 to 2012.[32] The unspent balance in the drinking water fund dropped to about $100 million.[33] As a result, EPA in May 2016 decided that California's system was back in compliance.[34]

Recent Analysis of California Records

The problem, however, is still far from fixed. An examination of California's online records by the Environmental Integrity Project (EIP) in May 2016 revealed that there were still 95 community water systems in the state, serving 55,985 people, providing drinking water with levels of arsenic that exceed the federal standard of 10 ppb in 2014 and 2015, according to two-year averages over those years. [35]

Over a longer period of time, 2011 through 2015, state records show 70 systems serving 46,772 residents, that each year have averaged higher than the limit in the Safe Drinking Water Act. These do not include homes on individual private wells, which are not covered by the federal Safe Drinking Water Act.

For a detailed discussion of the methods used to arrive at these numbers, please see Appendix C.

Examples of Drinking Water Contamination

Some of the worst water in community systems in California can be found in the Lakeview Community Association, which serves 160 residents in Shaver Lake (northeast of Fresno, in Fresno County). This community had an average arsenic concentration of nearly nine times the federal limit – 87 ppb – in 2014 and 2015, according to state data.[36]

Four water systems in the unincorporated community of Boron, in San Bernardino County, provided water to about 5,200 residents that had at least three times the safe limit of arsenic in 2014 and 2015.[37] In the city of Keyes in Stanislaus County, 4,891 people have tap water with arsenic concentrations that averaged above the federal limit each year for the last five years. The Pixley Public Utilities District, serving 3,310 residents, had arsenic levels in its drinking water that averaged 50 percent higher than health standards in 2011-2014.

Twelve school districts, serving a combined total of 5,462 students, had arsenic levels that averaged from 30 percent higher to three times the federal limit over the last five years. (See Table 4. Some of these school districts provided explanations, which will be discussed on pages 15 and 16 of this report).

Across California, there were 12 mobile home parks serving 889 people that had average arsenic levels ranging from 20 percent over legal limits to five times the federal standards from 2011 through 2015.[38]

Table 2: Top 10 Mobile Home Parks for Arsenic Contamination

Water System	County	People Served	2014-2015 Avg. (ppb)	2011-2015 Avg. (ppb)
Fountain Trailer Park Water	Kern	68	85.8	83.9
Sierra East Mobile Home Community	Mono	50	54.6	47.0*
Winterhaven Mobile Estates	Los Angeles	40	52.1	53.4
The Village Mobile Home Park	Los Angeles	70	45.1	47.0
Edgewater Mobile Home Park	Sacramento	40	38.0	37.6
Mitchell's Avenue E Mobile Home Park	Los Angeles	26	21.3	21.0
Millstream Mobile Home Park	Tehama	80	20.5	20.0
Country Western Mobile Home Park	Stanislaus	120	20.4	22.2
Saint Anthony Trailer Park	Riverside	300	19.7	21.5
New Orchard Mobile Home Park LLC	Tehama	125	19.6	19.0

Note: federal limit is 10 ppb arsenic. The 2011-2015 average for Sierra East Mobile Home Community reflects fewer than 5 years.

Response from California Officials

The Environmental Integrity Project asked the California State Water Resources Control Board why so many people are still exposed to contaminated drinking water after the state supposedly returned its system to compliance. Officials at the state agency replied in an interview and emails that they had issued orders to nearly all of the local utilities to fix the arsenic problem, but that some local government still need more time to upgrade their systems. In some cases, local utilities are building water filtration systems to remove arsenic, or digging new wells in an effort to extract cleaner water.

"The State Water Board Division of Drinking Water is working with each of these communities to return them to compliance," said Cindy Forbes, Deputy Director of the Division of Drinking Water at the Water Resources Board.[39] "District Office staff are working with these communities to evaluate alternative solutions, including new treatment options, new wells or modification of existing wells, and in some instances consolidation with larger water systems that can provide drinking water that meets all standards. The State Water Board is also helping communities that are struggling financially to reach compliance by offering financial assistance to solutions through low-interest loans and grants."

Public Notification of Drinking Water Violations

As the work continues to upgrade the drinking water systems, however, many citizens of California have not been given warnings to avoid drinking contaminated water.

The background is this: As part of the federal Safe Drinking Water Act, local water utilities are required to periodically test public drinking water systems that serve at least 25 people. When those results show more than 10 ppb arsenic (a standard imposed by EPA in 2001), the utilities must notify residents of the violation in writing by mail "as soon as practical, but within 30 days."[40] In California, however, the warning notices provide a mixed message, stating: "Our water system recently violated a drinking water standard," but also, "you do not need to use an alternative water supply (e.g., bottled water). This is not an emergency…. However, some people who drink water containing arsenic in excess of the (federal limit) over many years may experience skin damage or circulatory system problems, and may have an increased risk to getting cancer."[41] (For the full text of California's notice template for local utilities to use, see Appendix A)

This advisory says two contradictory things: Warning, you have a problem with your water. But don't worry – keep drinking it. If consumers are being told to ignore the federal health standards and keep drinking the contaminated water, there is no reason for the federal Safe Drinking Water standards for arsenic to exist. As stated previously in this report, California is much more clear about warning private well owners to "protect yourself and your family" from arsenic-tainted tap water. And other states – including Wisconsin, Michigan, Maine, and Washington – bluntly advise people not to drink private well water with more than 10 ppb arsenic.

In addition to receiving advisories about violations when they occur, customers also receive annual reports from their local water utilities called "Consumer Confidence Reports." These reports list the levels of more than a dozen different potential contaminants, including bacteria, lead, copper, nitrates and arsenic. When arsenic levels exceed the limit of 10 ppb, these reports provide the numbers and say: "Some people who drink water containing arsenic in excess of the MCL (maximum contaminant level) over many years may experience skin damage or circulatory system problems, and may have an increased risk of getting cancer."[42] But the reports do not tell consumers to stop drinking water with excessive levels of arsenic, and instead hint that it might not be a problem, saying: "Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants."

We asked the California State Water Resources Control Board why the agency doesn't tell people to avoid drinking water with illegal levels of arsenic. In response, Forbes, the deputy director for water, said that the state does provide this kind of blunt and immediate warning for other contaminants that can make consumers sick immediately, such as fecal bacteria. But for arsenic, she said, the threat is more long term. "Arsenic is categorized as a chronic contaminant that poses possible health risks after long-term exposure – 70-plus years of drinking two liters of arsenic-contaminated water a day above the maximum contaminant level," Forbes said. "There are no known acute/immediate health effects that would cause consumers to immediately stop drinking the water."

This answer, however, ignores the fact that many of these California residents have been drinking arsenic-contaminated water for decades. For example, Drs. Carolina Balazs and Isha Ray in 2014 published a study in the American Journal of Public Health in which they interviewed residents with contaminated tap water and found that the current notification requirements are poorly serving people with long-term exposure to pollutants.[43] "A resident from the community of Cutler explained that for years she had received Consumer Confidence Reports indicating that dibromochloropropane levels in the water exceeded the MCL (maximum contaminant level)," Balazs and Ray wrote. "These reports noted that residents should not worry because health impacts were not based on immediate exposure, but rather on lifetime exposure... She had lived in her community for nearly 30 years—so, she asked, should she worry or not? In these situations, water systems simply leave residents to cope with contaminated drinking water as best they can….In these instances, Safe Drinking Water Act regulations ultimately fail the (low-income) household."[44]

California's records identify more than 46,772 people whose tap water has had average levels of arsenic that have exceeded the federal standards for at least five years, from 2011 to 2015. But there is no reason to believe that these people received cleaner water before this. The longer a person drinks water contaminated with excessive levels of arsenic, the higher the increased risk of cancer. In much the same way, smoking a single cigarette is not an immediate health threat, in that it will instantly kill a person. But the longer a person smokes, the worse the health threat. For this reason, California would better protect public health if it told people to stop drinking arsenic-tainted water now, just as health warnings on tobacco required by the U.S. Food and Drug Administration advise, "WARNING: Quitting smoking now greatly reduces serious risks to your health." These advisories do not state, "WARNING: You do not need to change your smoking habits."

Evolution of the Science on Arsenic

One reason for stronger warning language is that scientific research continues to show that arsenic causes health problems – including brain damage in children -- at lower levels than previously thought.

The history of EPA's arsenic rule reflects the continuing evolution of scientific knowledge about the harms that even low levels of the element can cause. Back in 1996, Congress amended the Safe Drinking Water Act and directed EPA to establish new limits for arsenic to replace the old standard of 50 ppb. Based on the best available research, EPA proposed a limit of 5 ppb in 2000. Because arsenic is a carcinogen, some public health experts consider any level above zero to pose some risk. EPA then revised its proposal, based in part on cost considerations, and finalized a new arsenic standard of 10 ppb in 2001.

The EPA Administrator at the time, Christine Todd Whitman, explained that "the 10 ppb protects public health based on the best available science and ensures that the cost of the standard is achievable."[45] The new regulations required that public water systems across the U.S. meet the new standard by January 23, 2006.[46] The law allowed states to grant exemptions until January 23, 2015, for some small community water systems that had trouble complying.[47]

The 2014 Maine study discussed earlier in this report found found significant reductions in IQ in children exposed to arsenic concentrations of 5 to 10 ppb.[48] With this new information, EPA should change its own guidance for notification language so that people – especially parents of young children -- receive a clearer warning not to drink contaminated water. A template for warning language on the federal agency's website for drinking water systems with chemical contaminants such as arsenic advises utilities to tell their customers: "Some people who drink water containing arsenic in excess of the MCL (maxiumum contaminant level) over many years may have an increased risk of getting cancer." But the notices also say: "There is nothing you need to do….If you have specific health concerns, consult your doctor."[49] This is a problem, because many lower-income people do not have doctors with whom they can regularly consult about questions like water quality.

Responses from Local Drinking Water Systems

When asked about their drinking water violations by EIP, some of the utilities in California with illegal levels of arsenic replied that their attempts to fix the problem have been hindered by bureaucratic obstacles at the local level. Others indicated they are taking steps to solve the problem, but simply need more time or money. Not all public systems were contacted by EIP or provided answers.

Table 3. Top 10 Residential Water Systems for Arsenic Contamination (Excluding Mobile Home Parks)

System	County	Population Served	2014-2015 avg (ppb)	2011-2015 avg. (ppb)
Lakeview Improvement Association #1	Fresno	160	86.9	86.9*
Corral De Tierra Estates WC	Monterey	45	72.5	78.4
Keeler Community Service District	Inyo	50	71.3	75.6
Quail Valley Water District-Eastside System	Kern	60	70.1	69.1
MD #06 Lake Shore Park	Madera	130	64.3	71.9
Valley Teen Ranch	Madera	50	62.0	120.8
Shaver Lake Point #2	Fresno	210	52.3	42.9
Boron Community Service District	Kern	2500	38.1	38.0
Monterey Park Tract Comm. Service District	Stanislaus	186	31.9	34.3
North Edwards Water District	Kern	600	31.5	31.6

Note: The federal limit is 10 ppb arsenic. Lakeview had fewer than five years of data available.

At the **Lakeview Improvement Association** in Fresno County, 160 people have been receiving drinking water with more than eight times the legal limit of arsenic on average for

at least the last five years, according to state data. State records show that on May 16, 2016, the California Water Resources Control Board issued a citation to the association's water system, imposing a fine of $1,000 for its failure to follow the directives of two earlier compliance orders, in 2014 and 2015. "The water system continues to violate the arsenic maximum contaminant level (MCL) and does not appear to be making progress toward the compliance deadline," says the most recent letter from the state. "Additionally, the water system has failed to routinely conduct the public notification of the arsenic MCL violation, as required."

Philip Dutton, an engineer for surrounding Fresno County, said that the Lakeview Association's plan, as expressed verbally, is to test some in-home water filtration systems and see how well they perform.[50] "They've got a few of these (filtration systems) installed in homes, but they are sampling from different technologies to try and identify what is going to be the best long-term alternative," Dutton said. The California State Water Resources Control Board's website already lists which types of filtration technologies work well to remove arsenic.[51]

In **Kettleman City**, in Kings County, 1,450 residents have had tap water with excessive levels of arsenic for decades. The average from 2011 to 2015 was 20 percent above the legal limit, according to state data. "I have a daughter, a little one, who's still brushing her teeth with contaminated water, taking a bath in contaminated water," said Maricela Mares-Alatorre, a city resident, during a recent public hearing of the state water board.[52] The Kettleman City Community Services District has promised local residents that it will build a $9 million water treatment plant, but the project has been repeatedly delayed – with a target to open in the fall of 2016 recently pushed back to 2018.[53]

At the **Corral De Tierra Estates** subdivision in Monterey County, 45 people have been exposed to drinking water with arsenic levels almost eight times the legal limit from at least 2011 through 2016, state records indicate. This small water system has received 10 violations notices from the state for excessive levels of arsenic over the last decade, with the most recent in the first quarter of 2016, when it had 77 ppb of the contaminant (compared to the 10 ppb limit).

The manager of Monterey County's drinking water program, Cheryl Sandoval, said Corral De Tierra Estates is among at least five privately-owned water systems that have been issued corrective orders by the county because they are in violation of the arsenic standard. Solving the problem is taking longer than expected, Sandoval said, and some of the local water utilities are still debating the best path forward. "Dealing with the problem is very complicated," Sandoval said.[54] "They haven't made a lot of progress toward compliance, but they are going to have to." One challenge is that a water treatment plant for even a small system can cost hundreds of thousands of dollars and cause new waste disposal problems, because the plants produce concentrated arsenic sludge that must be handled carefully as a hazardous material. Corral De Tierra Estates and other subdivisions want to try in-home water treatment systems as a systemic solution, but county rules don't allow that, Sandoval said. However, debate over this in-home option continues, because new state regulations may open the door for in-home filtration as a systemic solution in the future.

Meanwhile, as the bureaucratic discussions continue, residents are receiving confusing advice about whether they should drink the water pouring from their taps with illegal levels of arsenic. One recent report from Corral de Tierra Estates to local water consumers, displayed on the state website and sent to homeowners in July 2014, advised people that arsenic levels were eight times above the legal limit.[55] But that fact was buried in the middle of a dense report with lots of numbers that also gave the impression that the exceedance was not a problem. The report told homeowners: "The presence of contaminants does not necessarily indicate that the water poses a health risk."[56]

At the **Quail Valley Water District-Eastside System** in Kern County, 60 residents have been receiving drinking water with seven times the legal limit of arsenic over the last five years, state records show. In April 2015, the state issued a compliance order to the local utility and mandated that it fix the problem by April 2018.

Randy Hardenbrook, Director of the Quail Valley Water District, said the problem should be solved within the next two years because a $5.8 million grant from the state is allowing the district to build a new pipeline. The pipe will be about 8.5 miles long and will connect a part of the system with arsenic-tainted water to a well that has good water.[57] In the interim, local residents receive quarterly letters with data on the arsenic exceedances but are not being provided with bottled water. More importantly, they are not being told to refrain from consuming the contaminated water. "We're not telling them not to drink it," Hardenbrook said, "but we are telling them there are long-term health effects."[58]

At the **Shaver Lake Point #2** subdivision in Fresno County, 210 people have been receiving tap water with more than four times legal levels of arsenic for at least the last five years, according to state data. In January 2015, the state wrote to the water system's administrators and ordered them to come into compliance with the federal and state arsenic limits by December 31, 2016.

With only four months left until the deadline, the arsenic levels remain illegally high and Robert Johnson, President of the Shaver Lake Point Mutual Water Company, said he is still thinking about what to do about the problem.[59] "Currently, it's being researched. We have engineers involved. We have water experts involved, and we are trying to figure it out," Johnson said. He added that building a water filtration system could cost as much as $250,000, so the subdivision is considering trying to blend water from its arsenic-tainted wells with cleaner water from different wells.

Meanwhile, nobody in the community is being warned to avoid the contaminated water. "There is no warning not to drink it. There is no 'non-drink' order out there," said Johnson.[60] When asked if his customers should drink bottled water as a precaution instead of the arsenic-tainted tap water, Johnson said: "It's one of those things, if you want to do it, that's your deal. It's not being recommended. We're not suggesting it. This is per the state of California."

Group Home for Troubled Children

The **Valley Teen Ranch**, a Christian residential treatment group home for 32 court-referred abused and neglected boys in Madera County, has arsenic in its tap water that averaged more than 12 times the federal limit from 2011 through 2015, according to state records.[61] "We've been out of compliance, but no children have gotten sick, no adults have gotten sick," said Connie R. Clendenan, CEO of the nonprofit organization that runs the group home. "Nobody wants to drink the water here because it's brown and nasty."[62]

About five years ago, the state approved a $5 million grant to help the group home solve the problem by linking its small water system to a larger one run by the county. But the work has not started yet. Because of ongoing negotiations at the county level, the fix could still be three years or more away, Clendanan said. Meanwhile, children are being given bottled water and are verbally warned not to drink tap water, although there are no warning signs posted above sinks.

"I want to get out of the water business. I'm in the kid business," Clendenan said. Of the continuing delays in fixing the problem with contaminated water, she said: "Nobody's mad. But it's government, and it takes a lot of time. It's just the stupid county."

Table 4. Schools with Excessive Arsenic in Drinking Water

System	County	Population Served	2014-2015 avg. (ppb)	2011-2015 avg. (ppb)
Kit Carson Elem. School	Kings	510	34.7	34.7*
Washington School WS	Monterey	250	26.1	27.7
MUSD-Nile Garden School	San Joaquin	804	20.9	22.8
Liberty High School	Madera	1340	17.9	20.5*
Island Union School	Kings	300	11.9	18.8
Winship Elementary School	Sutter	38	16.4	17.3*
Lakeside School	Kern	800	16.3	16.9
Barry Elementary School	Sutter	650	15.2	15.3
Pleasant Valley Elementary	San Luis Obispo	100	13.8	14.1
Gratton School	Stanislaus	110	13.5	13.5
North Fork Union School	Madera	350	12.9	12.4
Warner Unified School District	San Diego	250	10.9	11.4
Central Union Elementary	Kings	320	10.1	13.5

*Note: federal limit is10 ppb arsenic. *Indicates systems with monitoring gaps (less than five years available data)*

Arsenic in School Drinking Water

At the **Washington School in Salinas,** California, the tap water serving about 250 students has had almost three times the federal limit of arsenic for the last five years, 28 ppb on average over this time period, compared to the limit of 10 ppb.[63] School Principal Whitney Meyer said that the local school district has been discussing the problem for several years but does not yet have a solution. Meanwhile, students are given bottled water, she said.

"We remind them over and over that they cannot drink the water," Meyer said.[64] "Many of the students live out in this area and their homes are similarly impacted (with arsenic), so they also hear the message at home. We have drinking stations with clean water in every classroom, teaching space, and hallway. The fountains have all been shut down."

At the **Barry Elementary School in Yuba City**, California, the arsenic levels have averaged 50 percent above the federal limit for arsenic over the last five years. Because of the violations, the state issued a compliance order to the school in May 2015. Tom Butcher, Director of Maintenance and Facilities for the school system, said that the school has not yet solved the problem, but is giving bottled water to students as officials try to figure out a solution.[65] Adminstrators of the water system are discussing a consolidation with a larger neighboring system that has better water. "The (state) Water Board indicates a best case scenario of a consolidation in approximately 1.5 years," Butcher said. "Until the consolidation is completed (the school district) will continue to provide bottled drinking water."

At the **Kit Carson Elementary School**, in Hanford, Ca., arsenic levels in drinking water averaged more than three times the legal limit in 2011 through 2014, according to state records. In January 2015, the school solved the problem by connecting its pipes to the water system of the surrounding city,[66] whose arsenic levels are below the federal limits.

At the **Lakeside School in Bakersfield,** California, the arsenic levels in the drinking water averaged more than 70 percent above the federal limit for arsenic over the last five years, 17 ppb compared to the limit of 10 ppb. Ty Bryson, District Superintendent, said that the school notified all families by sending home notice letters with the students and by posting warnings in the office. "We provide bottled drinking water for students and staff," Bryson said. "We drilled an alternate well, but that also had unacceptable levels of contaminant. We are now pursuing an alternative source of drinking water by connecting to a local municipal water source via pipeline."

At the **Gratton School in Denair,** California, the drinking water system has had arsenic levels that averaged 40 percent above the federal limit for arsenic over the last five years, state records indicate. The school's superintendent, Shannon Sanford, said that students have been provided bottled water for the last two years. "Students were initially warned (not to drink the water) and signs were used until fountains were disabled," Sanford said. More recently, the school drilled a new well that will be used for the 2016-2017 school year that should solve the problem.

At the **Island Union School in Lemoore,** California, arsenic levels in the drinking water were nearly twice the federal limit from 2011 to 2015, averaging 18.8 ppb compared to

federal limit of 10 ppb, according to state records. Superintendent Charlotte Hines said the school dug a new well in 2015, and provided students and warnings and bottled water in the interim. "We know that bottled water is only a temporary solution," Hines said. "And in an effort to find a permanent solution, the school requested -- and was awarded -- state funding to drill a new well that would meet all primary drinking water standards."[67]

Military Base with Contaminated Water

At the **U.S. Army Base Fort Irwin** in San Bernardino County, 16,000 soldiers live in facilities that have had arsenic in some tap water at levels 50 percent higher than the federal limit from 2011 through 2015, state records indicate. For the last three years, the Army Corps of Engineers has been building a new $100 million water treatment plant at the base to solve the problem. The plant is now undergoing testing and is scheduled to go online in October 2016, base officials indicate.

"The new plant will treat all Fort Irwin water to comply with Safe Drinking Water act Standards for ALL pollutants of concern including …arsenic," said Muhammad A. Bari, Director Public Works at Fort Irwin.[68]

In the interim, soldiers have been provided with bottled water and warned which faucets to avoid, according to base managers.

Vineyards with High Arsenic Levels

In San Joaquin County, the **Delicato Family Vineyards** had arsenic levels in the tap water that averaged 18 ppb from 2011 through 2014, which was 80 percent higher than the federal limits, state records indicate. Kylie Barnett, a spokeswoman for the company, said that the vineyards worked with county officials in 2014 to build a new drinking water system, including by digging two new wells, which brought the arsenic levels down below the federal standard in 2015 and 2016.[69] "The drinking water is not used in production of our wine," Barnett noted. Before the repair, people working at the vineyards and visiting were provided bottled water, she said.

In Napa County, the **Larkmead Vineyards** had drinking water with six times more arsenic than allowed from 2011 through 2013, according to state records. No results were listed for 2014 or 2015, and it is unclear if the drinking water system, which serves 25 people, is used for workers or guests. (Wine making does not generally use tap water.) Emails sent to managers of the vineyard asking about the water were not returned. The researchers of this report also received no response from the **Black Stallion Winery** in Napa County, whose tap water had four times legal limits of arsenic from 2011 through 2015, according to state records.

Conclusion

California is making progress toward solving its drinking water contamination problem. The state has reorganized its drinking water agency, and increased its financial assistance to local utilities to build water treatment systems, dig new wells, and take other steps to resolve the issue. The work, however, is expected to take many more years. In the meantime, tens of thousands of people continue to be exposed to drinking water with illegal levels of arsenic, a carcinogen that could damage the developing brains of children and cause other health problems. And yet, the warnings that some of these residents receive from the government are contradictory and confusing.

Both California and the federal government need to do more to protect consumers, especially the young. This report recommends:

1) California and EPA should both revise the language for written notifications of violations of arsenic standards, so that people are clearly advised to stop drinking contaminated water. If the violations are in schools or group homes, warning signs should also be posted over all sinks and drinking fountains. The state should help provide bottled water as an interim solution.

2) Consumers should be provided more information through the mail about what works and what does not work to remove arsenic from tap water. Residents need to know, for example, that boiling water will not help, but that certain filtration systems can remove the carcinogen. In some cases, residents may need technical help from the state in understanding how to use filtration systems properly.

3) Both Congress and the state government should increase investments in upgrades to California's drinking water systems. This is not only an environmental justice issue, but also a sensible strategy to boost the local economy through the hiring of engineers, construction workers and others to improve local infrastructure.

Counter arguments made by California officials – that the state is already taking action, and that arsenic is not an immediate threat to public health – do not hold water. Although the state has issued enforcement orders to local utilities, some local officials clearly still need more prodding and money to upgrade their water systems. A growing amount of scientific research suggests that arsenic increases the risk of cancer and other diseases and may do so at a lower level than expressed in current federal regulations. Years more of exposure to arsenic-tainted water will only raise the risk of cancer or neurological damage for California residents.

The state and federal governments should advise people to stop drinking contaminated water immediately, just as public health experts urge smokers to change their habits sooner rather than later because it will increase their odds of survival.

With public health warnings, simple and direct is better than bureaucratic and complex, because safe is better than sorry when people's lives and minds are at risk.

APPENDIX A: California's Language for Public Notices about Arsenic Violations

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

Este informe contiene información muy importante sobre su agua potable.
Tradúzcalo o hable con alguien que lo entienda bien.

[System] Has Levels of Arsenic Above the Drinking Water Standard

Our water system recently violated a drinking water standard. Although this is not an emergency, as our customers, you have a right to know what you should do, what happened, and what we are doing to correct this situation.

We routinely monitor for the presence of drinking water contaminants. Water sample results received on [date] showed arsenic levels of [level and units]. This is above the standard, or maximum contaminant level (MCL), of 0.010 milligrams per liter.

What should I do?

- **You do not need to use an alternative water supply (e.g., bottled water).**
- This is not an emergency. If it had been, you would have been notified immediately. However, *some people who drink water containing arsenic in excess of the MCL over many years may experience skin damage or circulatory system problems, and may have an increased risk to getting cancer.*
- If you have other health issues concerning the consumption of this water, you may wish to consult your doctor.

What happened? What is being done?

[Describe corrective action]. We anticipate resolving the problem within [estimated time frame].

For more information, please contact [name of contact] at [phone number] or [mailing address].

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments,

nursing homes, schools, and businesses). You can do this by posting this public notice in a public place or distributing copies by hand or mail.

Secondary Notification Requirements

Upon receipt of notification from a person operating a public water system, the following notification must be given within 10 days [Health and Safety Code Section 116450(g)]:

- SCHOOLS: Must notify school employees, students, and parents (if the students are minors).
- RESIDENTIAL RENTAL PROPERTY OWNERS OR MANAGERS (including nursing homes and care facilities): Must notify tenants.
- BUSINESS PROPERTY OWNERS, MANAGERS, OR OPERATORS: Must notify employees of businesses located on the property.

This notice is being sent to you by [system].

State Water System ID#: _____. Date distributed: _____.

APPENDIX B: Listing of All California Public Drinking Water Systems with Arsenic Levels that Averaged Over the Federal Limit over the Last Five Years

System Name	County	Pop. Served	2014-2015 Avg (ppb)	2011-2015 Avg (ppb)	
Lakeview Improvement Association #1	Fresno	160	86.9	86.9	^
Fountain Trailer Park Water	Kern	68	85.8	83.9	*
Hungry Gulch Water System	Kern	33	72.6	70.0	*
Corral De Tierra Estates WC	Monterey	45	72.5	78.4	*
Keeler Community Service District	Inyo	50	71.3	75.6	*
Quail Valley Water District-Eastside System	Kern	60	70.1	69.1	*
CSA 70 W-4 Pioneertown	San Bernardino	625	64.5	61.6	*
MD #06 Lake Shore Park	Madera	130	64.3	71.9	*
Valley Teen Ranch	Madera	50	62.0	120.8	*
Sierra East Mobile Home Community	Mono	50	54.6	47.0	^
Shaver Lake Point #2	Fresno	210	52.3	42.9	^
Winterhaven Mobile Estates	Los Angeles	40	52.1	53.4	*
Olam Spices And Vegetables Inc.	Kings	75	48.4	46.7	*

System Name	County	Pop. Served	2014-2015 Avg (ppb)	2011-2015 Avg (ppb)	
The Village Mobile Home Park	Los Angeles	70	45.1	47.0	*
Callier Water System	San Bernardino	1000	42.1	49.2	^
Black Stallion Winery	Napa	25	41.8	41.8	^
Ironwood Camp	San Bernardino	1000	38.4	38.6	*
Boron CSD	Kern	2500	38.1	38.0	*
Edgewater Mobile Home Park	Sacramento	40	38.0	37.6	*
Prunedale MWC	Monterey	252	35.7	32.0	
Kit Carson Elem. School	Kings	510	34.7	34.7	^
Darr Water Co.	San Bernardino	1000	34.3	36.0	*
Monterey Park Tract Community Service District	Stanislaus	186	31.9	34.3	*
North Edwards WD	Kern	600	31.5	31.6	*
Desert Lake Community Service District	Kern	700	31.0	32.5	*
Locke Water Works Co [SWS]	Sacramento	80	29.5	29.1	*
Lucky 18 On Rosamond, LLC.	Kern	73	28.0	24.3	*
Washington School WS	Monterey	250	26.1	27.7	*
Rancho Marina	Sacramento	250	24.0	30.1	*
Colusa Co. WWD #1 - Grimes	Colusa	500	23.9	24.7	*
Bridgeport PUD	Mono	850	23.3	24.0	*
Country Hills Estates	San Luis Obispo	60	23.0	26.8	^
Doubletree Ranch Water System	Contra Costa	49	21.6	22.4	*
Mitchell's Avenue E Mobile Home Park	Los Angeles	26	21.3	21.0	*
Vista Del Toro WS	Monterey	87	21.0	20.4	*
MUSD-Nile Garden School	San Joaquin	804	20.9	22.8	*
Country Villa Apts.	Stanislaus	30	20.8	21.1	*
Millstream Mobile Home Park	Tehama	80	20.5	20.0	*
Country Western Mobile Home Park	Stanislaus	120	20.4	22.2	*
Saint Anthony Trailer Park	Riverside	300	19.7	21.5	*
New Orchard Mobile Home Park LLC	Tehama	125	19.6	19.0	*
MD #24 Teaford Meadow Lakes	Madera	150	19.0	12.5	
William Fisher Memorial Water Company	Kern	53	19.0	18.4	*
Ceres West Mobile Home Park	Stanislaus	161	18.9	18.0	*
Boulder Canyon Water Association	Kern	28	18.4	17.9	*
Lakeview Ranchos Mutual Water Company	Kern	120	18.1	22.4	*
Liberty High School	Madera	1340	17.9	20.5	^
Sutter Co. WWD #1 (Robbins)	Sutter	350	17.9	18.1	*
MD #42 Still Meadow	Madera	100	17.7	na	^
Maher Mutual Water Company	Kern	150	17.7	20.8	*
Cedar Valley Mutual Water Co.	Madera	137	17.6	18.6	^
First Mutual Water System	Kern	35	17.5	15.1	*
Sierra Co. W.W.D #1 Calpine	Sierra	225	17.0	14.1	*
Bar-Len MWC	San Bernardino	124	16.6	16.2	*

System Name	County	Pop. Served	2014-2015 Avg (ppb)	2011-2015 Avg (ppb)	
Winship Elementary School	Sutter	38	16.4	17.3	^
Lakeside School	Kern	800	16.3	16.9	*
Lanare Community Services Dist	Fresno	660	16.2	17.3	*
Delicato Vineyards	San Joaquin	25	15.6	18.3	^
Fourth Street Water System	Kern	56	15.6	14.0	*
Barry Elementary School	Sutter	650	15.2	15.3	*
Rand Communities Water District	Kern	450	15.1	15.3	*
US Army Fort Irwin	San Bernardino	16000	14.9	15.4	*
Pond Mutual Water Company	Kern	48	14.7	na	^
Alpaugh Community Services District	Tulare	1026	14.5	17.8	
Lands Of Promise Mutual Water Associatio	Kern	190	14.4	15.0	*
Pixley Public Util Dist	Tulare	3310	14.4	15.0	*
Caruthers Comm Serv District	Fresno	2497	14.3	15.4	*
Nord Road Water Association	Kern	32	14.2	15.0	*
Lancaster Park Mobile Home Park	Los Angeles	53	14.2	15.0	*
Mesa Del Toro MWC	Monterey	90	14.2	13.1	*
Green Run Mobile Estates	Stanislaus	100	14.0	15.1	*
Pleasant Valley Elementary	San Luis Obispo	100	13.8	14.1	*
Loch Haven Mutual Water Company	Sonoma	50	13.8	13.1	*
Gratton School	Stanislaus	110	13.5	13.5	*
Hillview Water Co-Raymond	Madera	290	13.4	17.8	
Mettler Valley Mutual	Los Angeles	100	13.0	13.1	*
Mobile Plaza Park	Stanislaus	125	13.0	12.7	*
Hilmar Cheese Company	Merced	1000	13.0	13.3	
North Fork Union School	Madera	350	12.9	12.4	*
Yosemite Forks Est Mutual	Madera	110	12.8	11.6	
MD #08 North Fork Water System	Madera	264	12.8	13.9	^
Keyes Community Services Dist.	Stanislaus	4891	12.3	12.8	*
Countryside Mobile Home Park	Stanislaus	60	12.1	12.5	*
Land Project Mutual Water Co.	Los Angeles	1500	12.1	13.5	*
El Adobe POA, Inc.	Kern	200	12.1	12.1	*
Island Union School	Kings	300	11.9	18.8	
Plumas Eureka CSD	Plumas	325	11.6	na	*
Kettleman City CSD	Kings	1450	11.4	12.0	*
Laguna Seca WC	Monterey	162	11.1	11.7	*
Los Molinos Comm. Services Dist.	Tehama	1500	11.1	9.0	
R.S. Mutual Water Company	Kern	67	11.0	11.1	*
Oasis Property Owners Association	Kern	100	10.9	10.8	^
Warner Unified School District	San Diego	250	10.9	11.4	^
MD #07 Marina View Heights	Madera	200	10.5	9.3	
Central Union Elementary	Kings	320	10.1	13.5	^

Note: Click on the hyperlink in the name of the system to view the state records for each water system.

** Indicates a system that has had annual concentrations averaging over the federal limit (10 ppb) each year 2011-2015*

^ Indicates that the 2011-2015 average includes years for which data was not available.

APPENDIX C:

Methods

This report is based on public data available from the California Environmental Protection Agency's State Water Resources Control Board (SWRCB) as of May 2016. We downloaded the SWRCB's Water Quality Analyses Database Files for 2011-2016 and identified public water systems that had arsenic concentrations that exceeded the 10 ppb Maximum Contaminant Level, targeting the systems with frequent exceedances between 2011 and 2015. The SWRCB database contained results for each water source used by a drinking water system, such as wells, treated or blended water, and standby wells that are only allowed to be used for a few days during a year. SWRCB warns users of its database that results in the database may not reflect the quality of water that systems actually served their customers.

Calculating average arsenic concentrations

- We calculated the average arsenic concentration from each individual water source at each water system using the sampling results available in SWRCB's database as of May 2016. Some sampling results from the end of 2015 may not have been available in the database at the time we downloaded the data in May.

- We reviewed each water system's source descriptions to determine which sources represented water served to consumers and whether the source should be included in the system-wide average arsenic concentration. For example, if the database showed that a system had two groundwater wells and a 'treated' source, we assumed that consumers would be served the treated source if results for that treated source were available each year. If the database listed a treated source in 2011, for example, but contained no data from that source for the following years, we excluded that source from the average because it was not clear if the system continued treating water for arsenic. If a system listed a source as inactive or as a 'standby' option, we excluded that source from the analysis because we could not determine when or if the water was used. We compared the selected sources with available Consumer Confidence Reports available through California's Drinking Water Watch system and narrative information in public SWRCB enforcement action documents to verify, to the extent possible, that the sources we selected represented water that was provided to consumers. If no information was available for a particular system, we relied on the

assumptions described above (i.e. inactive and standby sources were not used, treated sources were used instead of untreated sources when concentrations were available for each year). We did not include purchased water sources.

- After identifying individual sources, we calculated the system's annual average arsenic concentration using the annual average concentrations from each source. The average concentrations during the two-year period between 2014 and 2015 and the five year period between 2011 and 2015 are time-weighted average concentrations (i.e. we averaged the annual average concentrations from each year). This method is similar to how the California EPA's Office of Environmental Health Hazard Assessment calculated average concentrations at drinking water systems for use in it's 2014 CalEnviroScreen 2.0 tool, except we focused on annual average concentrations from 2011-2015, rather than a single average concentration from 2005-2013.

- We excluded entire systems from the analysis if a) they were inactive, b) the available data and source descriptions did not allow us to confidently assume that customers received the sampled water at their taps, and c) the average concentration over the most recent two years (2014-2015) fell below the MCL.

Mapping Public Water Systems

To map water system locations, we found the centroids of public water system boundaries from the California Environmental Health Tracking Program's Water Systems Geographic Reporting Tool, or Water Boundary Tool (WBT). For systems without boundaries in the WBT, we determined coordinates from the addresses in the SWRCB Water Quality Analysis database files and the California Drinking Water Watch system.

Notes

[1] Based on averages for 2014-2015. Numbers in this report from the California State Water Control Resources Board online database, "Drinking Water Watch," https://sdwis.waterboards.ca.gov/PDWW/ Records accessed May, 2016.
[2] U.S. EPA (1998), Integrated Risk Information System, Inorganic Arsenic, available at http://www.epa.gov/iris/subst/0278.htm.
[3] Carolina L. Balazs, Rachel Morello-Frosch, Alan E. Hubbard and Isha Ray, "Environmental justice implications of arsenic contamination in California's San Joaquin Valley: a cross-sectional, cluster-design examining exposure and compliance in community drinking water systems," Environmental Health, 2012. Link: https://ehjournal.biomedcentral.com/articles/10.1186/1476-069X-11-84
[4] California State Water Control Resources Board online database, "Drinking Water Watch," https://sdwis.waterboards.ca.gov/PDWW/ Records accessed May. Records show 51,306 residents receiving drinking water from 2011-2015 with annual averages of more than 10 ppb.

[5] California Code of Regulations Title 22, Chapter 15, Section 64463.4(b)] reglations require notifications for arsenic exceedances. The California State Water Resources Board template for the language in notifications to be sent out by local water utilities is available on state agency's website at: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Notices.shtml.

[6] California State Water Resources Control Board website, link: http://www.waterboards.ca.gov/drinking_water/certlic/device/watertreatmentdevices.shtml
[7] Ibid.
[8] Telephone interview with Connie R. Clendenan, CEO of the Valley Teen Ranch nonprofit organization, on August 1, 2016.
[9] Ibid.
[10] Texas Commission on Environmental Quality Notice of Drinking Water Arsenic Violation. Available at https://www.tceq.texas.gov/assets/public/permitting/watersupply/pdw/notices/chemical/arsenic.pdf
[11] Wisconsin Department of Natural Resources, Arsenic, Available at: http://dnr.wi.gov/topic/groundwater/arsenic/, accessed 3/7/2016.
[12] Florida Department of health, Brueau of Environmental Health, "Chemicals in Private Drinking Water Wells Fact Sheet- Arsenic," Available at: http://www.floridahealth.gov/environmental-health/drinking-water/_documents/arsenic-fs.pdf. Accessed 3/7/2016.
[13] See e.g. U.S. Department of Health and Human Services, (2004), "Health Consultation: Arsenic in Private Drinking Water Wells, Cornville, Yavapai County, Arizona," available at: http://www.atsdr.cdc.gov/HAC/pha/ArsenicInPrivate061504-AZ/ArsenicInPrivateHC061504.pdf, accessed 3/8/2016.
[14] Wasserman et al. (2014), A Cross-Sectional Study of Well Water Arsenic and Child IQ in Maine Schoolchildren, Environ Health 13:23-32.
[15] Based on averages for 2014-2015. Numbers from California State Water Control Resources Board online database, "Drinking Water Watch," https://sdwis.waterboards.ca.gov/PDWW/ Records accessed July 28, 2016.
[16] Letter from Jared Blumenfeld, Director of EPA's Region 9 office, to California Department of Public Health Director Dr. Ron Chapman, April 19, 2013. Link: https://www3.epa.gov/region9/water/grants/pdf/CDPHNoticeofNonCompliance.pdf
[17] U.S. Centers for Disease Control, fact sheet on arsenic. Available at http://www.cdc.gov/biomonitoring/pdf/Arsenic_FactSheet.pdf
[18] U.S. EPA (1998), Integrated Risk Information System, Inorganic Arsenic, available at http://www.epa.gov/iris/subst/0278.htm.

[19] The EPA describes arsenic's cancer-causing potency with a 'slope factor' (because it describes the slope of the dose-response curve). The current EPA slope factor for arsenic is 1.5 per mg/kg-d. This number represents the risk that can be expected from consuming one milligram of arsenic per kilogram of body weight per day. The EPA also translates the slope factor into a 'drinking water unit risk' of 5×10^{-5} per µg/L. For carcinogens, the formal MCL Goal is always zero. Zero is an unattainable goal, so in most cases the EPA will reduce exposure to carcinogens to a level of 'acceptable risk,' something between 10^{-6} (1 in 1,000,000) to 10^{-4} (1 in 10,000).[19] One way of looking at this range is to assume that risks less than 1 in 1,000,000 are always 'acceptable,' while risks greater than 1 in 10,000 never are. The risks of drinking arsenic at the MCL of 10 µg /L are much higher than 1 in 10,000.

[20] See, e.g., National Research Council, Critical Aspects of EPA's IRIS Assessment of Inorganic Arsenic – Interim Report, 82 – 83 (2013). For health endpoints like childhood IQ, the critical window of exposure is obviously much less, encompassing in utero development and childhood.

[21] EPA web page, "Drinking Water Arsenic Rule History," available at: https://www.epa.gov/dwreginfo/drinking-water-arsenic-rule-history.
[22] ATSDR (2007), Toxicological Profile for Arsenic; Grandjean and Landrigan (2014), Neurobehavioural Effects of Developmental Toxicity, *Lancet Neurol* 13:330-338.

[23] Wasserman et al. (2014), A Cross-Sectional Study of Well Water Arsenic and Child IQ in Maine Schoolchildren, *Environ Health* 13:23-32.

[24] Ibid.

[25] Ibid.
[26] California Water Resources Board report to the California legislature, "Communities that Rely on a Contaminated Groundwater Source for Drinking Water," January 2013. Link: http://www.waterboards.ca.gov/water_issues/programs/gama/ab2222/docs/ab2222.pdf
[27] California Water Resources Board report to the California legislature, "Communities that Rely on a Contaminated Groundwater Source for Drinking Water," January 2013. Link: http://www.waterboards.ca.gov/water_issues/programs/gama/ab2222/docs/ab2222.pdf
[28] Carolina L. Balazs and colleagues, "Environmental Justice Implications of Arsenic Contamination In California's San Joaquin Valley: a Cross-Sectional, Cluster-Design Examining Exposure and Compliance in Community Drinking Water Systems," Environmental Health, November 14, 2012. Link: https://ehjournal.biomedcentral.com/articles/10.1186/1476-069X-11-84
[29] Ibid.
[30] Letter from Jared Blumenfeld, Director of EPA's Region 9 office, to California Department of Public Health Director Dr. Ron Chapman, April 19, 2013. Link: https://www3.epa.gov/region9/water/grants/pdf/CDPHNoticeofNonCompliance.pdf
[31] Ibid.
[32] California Water Boards press release, "State Water Board, Drinking Water Revolving Fund Return to Safe Drinking Water Act Compliance," May 26, 2016. Link: http://www.waterboards.ca.gov/press_room/press_releases/2016/pr052616_cap_release.pdf
[33] Ibid.
[34] Ibid.
[35] Based on averages for 2014-2015. Numbers from California State Water Control Resources Board online database, "Drinking Water Watch," https://sdwis.waterboards.ca.gov/PDWW/ Records accessed July 28, 2016.
[36] Ibid.
[37] Ibid.
[38] Ibid.
[39] Email from Andrew DiLuccia, Public Information Officer for the California State Water Resources Control Board, containing quote from Cindy Forbes, Deputy Director of the Division of Drinking Water, on August 8, 2016. Telephone interview with Forbes on August 4, 2016.
[40] California State Water Resources Board, template for public notification of Arsenic MCL Exceedance, Link: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Notices.shtml
[41] Ibid.
[42] Example of Consumer Confidence Report for a California system can be found on the state website: https://sdwis.waterboards.ca.gov/PDWW/JSP/WaterSystemDetail.jsp?tinwsys_is_number=370&tinwsys_st_code=CA&wsnumber=CA1000071#
[43] Carolina L. Balazs and Isha Ray, "The Drinking Water Disparities Framework: On the Origins and Persistence of Inequities in Exposure," American Journal of Public Health, April 2014, Vol 104, No. 4. Link: http://www.ncbi.nlm.nih.gov/pubmed/24524500.
[44] Ibid.
[45] Ibid.
[46] Ibid.
[47] 40 CFR 142.20(a)(2)
[48] Wasserman et al. (2014), A Cross-Sectional Study of Well Water Arsenic and Child IQ in Maine Schoolchildren, Environ Health 13:23-32.
[49] U.S. EPA public notification template on EPA website: https://www.epa.gov/dwreginfo/public-notification-templates-community-and-non-transient-non-community-water-systems
[50] Telephone interview on August 25, 2016 with Philip Dutton, engineer for Fresno County.
[51] California State Water Resources Control Board website, http://www.waterboards.ca.gov/drinking_water/certlic/device/watertreatmentdevices.shtml
[52] KFSN-TV, ABC-30 in Fresno, report "Kettleman City Residents Get Answers to Questions about Construction of Water Treatment Plant," August 31, 2016. Link: http://abc30.com/society/kettleman-city-residents-get-answers-to-questions-about-construction-of-water-treatment-plant/1493726/
[53] Ibid.

[54] Telephone interview on August 26, 2016, with Cheryl Sandoval, Supervising Environmental Health Specialist and Manager of Monterey County's drinking water program.
[55] Corral de Tierra Water Company 2013 Consumer Confidence Report, dated July 11, 2014.
[56] Ibid.
[57] Telephone interview on August 26, 2016, with Randy Hardenbrook, Director of the Quail Valley Water District.
[58] Ibid.
[59] Telephone interview on August 25, 2016, with Robert Johnson, President of the Shaver Lake Point 2 Mutual Water Company.
[60] Ibid.
[61] Numbers from California State Water Control Resources Board online database, "Drinking Water Watch," https://sdwis.waterboards.ca.gov/PDWW/ Records accessed July 28, 2016.
[62] Telephone interview with Connie R. Clendenan, CEO of the Valley Teen Ranch nonprofit organization, on August 1, 2016.
[63] Numbers from California State Water Control Resources Board online database, "Drinking Water Watch," https://sdwis.waterboards.ca.gov/PDWW/ Records accessed July 28, 2016
[64] Email from Whitney Meyer, Principal of the Washington School in Salinas, California, on August 1, 2016.
[65] Email from Robert Shemwell, Assistant Superintendent of Business Services of the Yuba City Unified School District, containing quote from Tom Butcher,Director of Maintenance and Facilities, on August 12, 2016.
[66] Email on August 24, 2016, from Liliana Stransky of the Kings County Department of Public Health.
[67] Email from Superintendent Charlotte Hines of the Island Union School in Lemoore, California, August 4, 2016.
[68] Email from Kenneth Drylie, Public Affairs Specialist at Fort Irwin, containing quotes from Muhammad A. Bari, Director Public Works at the forst, on August 11, 2016.
[69] Email from Kylie Barnett, Director Public Relations at Delicato Family Vineyards, August 10, 2016.

ENVIRONMENTAL INTEGRITY PROJECT

1000 Vermont Avenue, NW
Suite 1100
Washington, DC 20005
202-296-8800
www.environmentalintegrity.org