

# Health Consultation

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BLUE RIDGE ELEMENTARY SCHOOL  
LAKESIDE, NAVAJO COUNTY, ARIZONA

FEBRUARY 17, 2005

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Public Health Service  
Agency for Toxic Substances and Disease Registry  
Division of Health Assessment and Consultation  
Atlanta, Georgia 30333

## **Health Consultation: A Note of Explanation**

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

Drinking and Irrigation Water Quality

BLUE RIDGE ELEMENTARY SCHOOL

LAKESIDE, NAVAJO COUNTY, ARIZONA

Prepared by:

Office of Environmental Health  
Environmental Health Consultation Services  
Arizona Department of Health Services  
Under Cooperative Agreement with the  
U.S. Department of Health and Human Services  
Agency for Toxic Substances and Disease Registry

## **Purpose**

This health consultation was prepared by the Arizona Department of Health Services (ADHS). It documents the evaluation of irrigation well samples collected by the Arizona Department of Environmental Quality (ADEQ) in October 2003 at the Blue Ridge Elementary School, Lakeside, Navaho County, Arizona. These samples were collected to fill a data gap identified in an earlier public health consultation. ADHS staff also reviewed the most recent water quality report (2002) available from the drinking water supplier, Arizona Water Company, Inc.

## **Background and Statement of Issues**

In a previous public health consultation (*Blue Ridge Elementary School, Lakeside, Navajo County, Arizona Health Consultation-April 30, 2003*), the Arizona Department of Health Services (ADHS) reviewed environmental conditions at the Blue Ridge Elementary School (BRES). Parents and school staff were concerned that environmental exposures were causing students to be absent from school. Drinking-water quality reports, indoor air quality data, food safety, environmental sanitation records, student attendance rates, and the results of an annual parent satisfaction survey were evaluated in the consultation. ADHS concluded environmental conditions at BRES posed no apparent public health hazard, and that attendance rates at the time were similar to statewide attendance rates.

As part of the 2003 public health consultation, ADHS requested the school district to conduct water sampling from the on-site irrigation water wells for the school grounds. This consultation documents the evaluation of those new data.

BRES is located at 1200 West White Mountain Boulevard, Lakeside, Arizona. It was built in 1974. Lakeside is on State Highway 260, southeast of Show Low in southern Navajo County. There are 700 students enrolled in kindergarten through third grade at BRES, and there are 75 teachers and support staff employed there (1).

## **Drinking Water Quality**

The Arizona Water Company (AWC) provides drinking water to BRES from wells located throughout the Lakeside area. In the April 2003 health consultation, ADHS reviewed AWC annual reports for 1997 – 2001. ADHS determined that drinking water at BRES did not represent a public health threat. A review of AWC's annual report for 2002 indicated that drinking water supplied to BRES continues to meet all applicable state/federal safe drinking water standards (2).

## **Irrigation Water Quality**

The BRES grounds are flood-irrigated with groundwater from a water storage tank that collects groundwater from the two on-site wells. At the time of the April 2003 health consultation, current water quality data for the irrigation well water were not available. The school maintenance supervisor reported that past sampling results from the wells had been acceptable.

At the request of ADHS, the school district obtained a composite water sample from the water storage tank and both on-site irrigation wells in the summer of 2003. Trichloroethylene (TCE) exceeded EPA's Maximum Contaminant Level (MCL) of 5 parts per billion (ppb) in this sample. It could not be determined whether levels were high in both the wells and the storage tank.

Subsequently, ADEQ collected additional groundwater samples in October 2003 from the two irrigation wells and the storage tank. These samples were analyzed by the Arizona State Laboratory for volatile organic compounds (VOCs). TCE was the only contaminant detected in these samples (Table 1). Information on TCE is provided in Attachment 1.

Although results confirmed the presence of TCE in groundwater, the source is not known and is being investigated by ADEQ. School officials were informed of testing results. This consultation has been prepared to document the assessment process.

**Table 1: Irrigation Water Sampling Results**

Sample Location	TCE (trichloroethylene) concentration (micrograms per liter, µg/l)	Above MCL? (5 µg/l)
Irrigation Well #1	5.3	Yes
Irrigation Well #2	2.3	No
Irrigation Water Storage Tank (Sample #1)	2.5	No
Irrigation Water Storage Tank (Sample #2)	2.5	No

### Discussion

Irrigation Well #1 is used only for on-site irrigation. The school maintenance supervisor stated that the school grounds are irrigated when it does not interfere with student use during the school day. During summer months, some irrigation does occur during daytime hours. The maintenance department avoids irrigating if it will leave the grounds wet during scheduled sports events or other outdoor school activities. The frequency and amount of irrigation needed during the school year and the winter months is limited because the average snowfall for Pinetop-Lakeside is 47.2 inches per year (4).

Limited dermal, inhalation, and ingestion exposures are possible for anyone who contacts the contaminated irrigation water (Table 2).

**Table 2. Completed Exposure Pathways**

Source	EXPOSURE PATHWAY COMPONENTS				Contaminant of Concern
	Media	Point of Exposure	Route of Exposure	Estimated Population	
Irrigation Well #1	Groundwater	Irrigation water	Inhalation Dermal Ingestion	700	TCE

Exposures were calculated for children, as they are the most sensitive population. ADHS estimated exposures to irrigation water containing trichloroethylene by assuming that children play in the flood irrigation water for one hour, 24 times per year (once per week for 6 months) for 12 years. ADHS assumed that a child would incidentally ingest 0.05 liters (50 milliliters) during each play event, and used a child body weight of 15 kilograms (5). We considered these to be separate acute exposures because TCE does not bioaccumulate.

The estimated exposure dose is based on the maximum concentration detected and represents a “worst case scenario.” The ingested dose from drinking water was doubled in order to take into account skin absorption and inhalation of vapors resulting from contact with the irrigation water. The assumption is that the combined dose from these two routes of exposure is equivalent to that of ingestion (6). Childhood doses were compared to the acute ATSDR Minimal Risk Level (MRL) for acute ingestion of trichloroethylene, which is an exposure dose below which no adverse, noncancer health effects are expected. Estimated exposure levels are low and below the oral MRL for the ingestion pathway (Table 3).

**Table 3. Trichloroethylene (TCE) Noncancer Estimates for Well #1.**

TCE concentration (µg/L)	Pathway	Child’s Estimated Noncancer Daily Dose (mg/kg-day)	Health Guideline (mg/kg -day)	Exceeds Guideline?	Source
5.3	Ingestion	0.046 <sup>1</sup>	0.20 (acute)	No	MRL <sup>2</sup>

<sup>1</sup> The exposure dose calculated for ingestion (0.023 mg/kg-day) was doubled to take into account exposures from inhalation and dermal contact.

<sup>2</sup> MRL: Health-based comparison values have been developed by ATSDR for chemical in various environmental media. The values define the concentration at or below which carcinogenic and/or noncarcinogenic health effects are not likely to occur after exposure. Contaminant concentrations exceeding these values do not necessarily pose a health threat, but have been further evaluated to determine the potential for health effects. In the case of TCE, there is currently only an acute oral MRL for noncancer health effects (<http://www.atsdr.cdc.gov/mrls.html>).

### Cancer

EPA is currently reevaluating the carcinogenic classification for TCE. There is currently no cancer risk evaluation guide (CREG) available for TCE. The International Agency for Research on Cancer (IARC) determined that TCE is a probable human carcinogen based on limited human data and sufficient data in experimental animals (3). At the BRES, TCE exposure, if any occurs, is infrequent and at very low levels. No increased risk of cancer is expected as a result of these exposures.

### **Child Health Issues**

All exposure-dose estimates were calculated assuming childhood exposure, thus incorporating exposure assumptions that reflect a child’s greater intake of water relative to body weight. All conclusions and recommendations about using water from these wells were based on the characteristics of this sensitive population. TCE levels were below the MCL in three of the four samples from BRES. The highest TCE level found was in the same concentration range as the MCL. The exposure scenarios indicated that these levels are not a cause for health concern.

### **Conclusions**

The levels of TCE found in water samples from Irrigation Well #1, and the exposure scenarios used in this assessment, indicate that using Irrigation Well #1 for watering the school grounds poses **no apparent public health hazard**.

### **Recommendations**

No recommendations.

### **Public Health Action Plan**

ADHS has worked with the BRES District to address public health-related concerns and provided an interim update on sample results until this consultation could be completed.

This health consultation will be distributed to the ADEQ Water Quality Assurance and Revolving Fund Program. It will also be sent to the BRES District to provide a follow-up to previous information provided to the school.

### **References**

1. Arizona Department of Health Services. 2003. Blue Ridge Elementary School, Lakeside, Navajo County, Arizona Health Consultation. April 2003.
2. Arizona Water Company. 2002. Annual water quality report for Lakeside, Arizona.
3. Case Studies in Environmental Medicine. ATSDR. 2001. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Division of Health Education and Promotion). January 2001.
4. Arizona Department of Commerce. 2003 (Sept.). Available at <http://www.azcommerce.com>. Accessed October 5, 2004.
5. U.S. Environmental Protection Agency. 2002. Child-specific exposure factors handbook. USEPA, National Center for Environmental Assessment, Washington D.C. EPA 600/p/00/002B. Available from National Information Service, Springfield, VA. (Document No. PB2003-101678).
6. Washington State Department of Health. 2002. Health Consultation for Cadet Manufacturing. Vancouver, Clark County, Washington. January 2002.

### **PREPARERS OF REPORT**

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## **CERTIFICATION**

The Arizona Department of Health Services, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), prepared this health consultation on drinking and irrigation water at Blue Ridge Elementary School, Lakeside, Navajo County, Arizona. It was prepared in accordance with approved methodology and procedures existing at the time.

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Allen Robison  
Technical Project Officer  
Superfund and Program Assessment Branch  
Division of Health Assessment and Consultation

The Division of Health Assessment and Consultation has reviewed this health consultation and concurs with its findings.

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Bobbi Erlwein  
Team Leader, Cooperative Agreement Team  
Superfund and Program Assessment Branch  
Division of Health Assessment and Consultation  
ATSDR



## **Attachment 1**

### **Additional Information on Trichloroethylene**

Trichloroethylene (TCE) was originally developed as an anesthetic for surgery. It has an odor similar to ether or chloroform, and evaporates very quickly. Today, TCE is used as an industrial cleaner to remove grease from metal parts. It is also used in paint removers, paint strippers, adhesives/glues, spot removers and cleaning fluids for rugs.

Health effects from exposure to TCE vary depending on the exposure concentration, how long the exposure lasts, and the exposure pathway. Dizziness, headaches, slowed reaction times, sleepiness, and facial numbness have occurred in workers breathing TCE or in people who use products containing TCE in poorly ventilated areas. The effects caused by exposures to TCE disappear when the exposure ends. The levels of TCE causing these effects are much greater than (a) the allowable occupational exposure level (50 parts per million) and (b) any levels expected to be found in air at, or near, BRES.

Studies in animals show that ingesting or breathing levels of TCE which are higher than typical environmental levels can produce nervous system changes, liver and kidney damage, effects on the blood, tumors of the liver, kidney, lung, and male sex organs, and possible cancer of the tissues that form the white blood cells. Results of a few studies in some pregnant animals exposed to TCE in air or food showed effects in unborn animals or in newborns. None of these effects have been definitely shown to occur in humans.

U.S. Environmental Protection Agency is currently re-evaluating the carcinogenic classification for TCE. There is currently no cancer risk evaluation guide (CREG) available for TCE. The International Agency for Research on Cancer (IARC) has determined that TCE is a probable human carcinogen based on limited human data and sufficient data in experimental animals (3).