

Health Consultation

BLUE RIDGE ELEMENTARY SCHOOL

LAKESIDE, ARIZONA

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

Introduction

The Arizona Department of Health Services (ADHS) was asked by the Environmental Protection Agency (EPA) to evaluate the environmental conditions at the Blue Ridge Elementary School in Lakeside, Arizona. The U.S. Environmental Protection Agency had received a request for assistance from community members concerned about environmental conditions at the school.

The Blue Ridge Elementary School began receiving complaints from parents and staff in 1996. The primary complaints were related to air quality problems associated with renovation activities. The school responded to these complaints by hiring a consultant to evaluate the environmental conditions at the school. The school received a report in 1997 containing several recommendations that the school implemented in 1997.

A group of parents continued to express concerns about environmental conditions at the school. This group suggested that environmental exposures might be causing some students to be absent from school. In response to these complaints, the school hired another environmental consultant to conduct a follow up environmental assessment in December 2002.

This report summarizes and evaluates the environmental data collected for the school and examines school attendance rates to determine whether students are absent more than at similar schools and if so, whether environmental conditions could be a contributing factor.

Background

The Blue Ridge Elementary School has 700 students enrolled in kindergarten through 3rd grade and employs 75 teachers and support staff (ADE 2003). The school, built in 1974, is located at 1200 West White Mountain Boulevard in Lakeside, Arizona. A map of the area is in the Appendix.

Lakeside is on State Highway 260, southeast of Show Low in southern Navajo County. The population of Lakeside is 3,680, but that population grows to approximately 30,000 residents in the summer months. The town is both a winter and summer resort community (ADOC 2003).

An indoor air quality investigation was conducted at the school in 1997. This investigation was performed by a private contractor after the school received complaints from parents and staff regarding renovations occurring within the school. The report provided recommendations for improvements to the air ventilation system and duct system, dust control, and repairs to a diesel-fired pump located in a furnace room. In addition, the report suggested that an industrial hygienist be included in planning future renovation projects. In response to the recommendations in the report, the school performed repairs to the air ventilation and duct systems, enhanced janitorial services, made necessary repairs to the furnace room, and installed a smoke stack to vent fumes from the diesel-fired pump. The investigation results were presented at a public meeting attended by school administrators and the public in 1997.

Discussion

The Arizona Department of Health Services reviewed the available data for Blue Ridge Elementary School. The data include water quality reports, the 2002 indoor air quality assessment, school attendance records, county food safety records, and school grounds records. The Arizona Department of Health Services staff visited the school in February 2003.

Drinking Water Quality

The Arizona Department of Environmental Quality (ADEQ) administers an environmental program to ensure that all drinking water systems in Arizona comply with the federal Safe Drinking Water Act. This act requires that water systems regularly test for a number of drinking water contaminants. All water systems must comply with the Maximum Contaminant Levels established by the United States Environmental Protection Agency (USEPA 1999).

The Arizona Water Company provides drinking water to Blue Ridge Elementary School from wells located throughout the Lakeside area. Drinking water supplied by the company meets all federal safe drinking water standards. In addition, contaminant levels in drinking water supplied to the school are lower than Agency for Toxic Substances and Disease Registry Comparison Values. Comparison values are concentrations in water that are unlikely to cause a health threat.

There have been no detections of industrial solvents or gasoline components in the Lakeside drinking water, and the levels of naturally occurring elements are below levels of concern. These facts suggest that the drinking water at the school does not represent a health threat. Table 1 presents the levels of contaminants that have been detected in the water system that supplies water to the school (AWC 2001).

Table 1: Detected Water Quality Constituents 1997-2001

	Average Concentration (mg/L)	ATSDR Comparison Value (CV) (mg/L)	Maximum Contaminant Level (MCL) (mg/L)	Above CV?	Above MCL?
Arsenic	0.004	10	0.050 ^b	No	No
Barium	0.28	0.7	2	No	No
Nitrate	0.63	20	10	No	No
Fluoride	0.25	--	4	--	No
Copper	0.17	--	1.3 ^{bb}	--	No
Lead	0.012	--	0.015 ^{bb}	--	No
Dichloromethane	0.002	--	0.005	--	No
Chloroform	0.0006	0.1	--	No	--
	(pCi/L)	(pCi/L)	(pCi/L)		
Alpha emitters	5	5	15	No	No
Radon	330	--	4000 ^{bbb}	--	No

^b Arsenic MCL lowers to 0.010 mg/L in 2006. mg/L = milligrams per liter

^{bb} USEPA Action Level

^{bbb} USEPA Proposed Radon Rule 8/2003

pCi/L = picoCuries/liter

-- = not applicable

Irrigation Water Quality

The playground for the Blue Ridge Elementary School is flood-irrigated with water from an on-site well. There are no recent water quality data for the irrigation well. Historic sampling of the well suggests that water from the well is of good quality and that the water would not cause health problems if children and school staff had contact with it. The school district is in the process of arranging additional sampling for this well, and data are likely to be available before the fall 2003 school session (Aylstock 2003).

Indoor Air Quality

The Health Effects Group, Tucson, Arizona, conducted an indoor air assessment for Blue Ridge Elementary School in December 2002. The purpose of the assessment was to identify indoor air quality issues within the school and to provide specific recommendations to improve the indoor air quality as well as safety and maintenance practices.

Table 2 presents the results of the indoor air monitoring assessment. Indoor air quality parameters were measured with a TSI Incorporated Indoor Air Quality Meter Model 8762. Indoor air quality parameters measured included carbon monoxide and carbon dioxide (HEG 2003).

Table 2: General Indoor Air Quality Parameters

	Concentration Range (ppm)	Average Concentration (ppm)	Reference Value (ppm)	Exceeds Reference or Standard?
Carbon monoxide	0.0–2.1	1.4	9 ^b	No
Carbon dioxide	620–1000	853	1000 ^{bb}	No

^b National Ambient Air Quality Standard (annual)

^{bb} American Society of Heating, Refrigeration, and Air Conditioning Engineers Recommendation

Carbon monoxide

Carbon monoxide, produced by the combustion of petroleum products, is commonly present in ambient air at low levels. The most common sources of indoor carbon monoxide are motor vehicle emissions and stationary sources, such as furnaces and water and space heaters.

Carbon monoxide levels ranged from 0 to 2.1 parts per million (ppm) with an average of 1.4 ppm in the 33 classrooms and the front office area. Outdoor or background concentrations were between 0 and 4 ppm. Levels of carbon monoxide measured during the investigation are below the National Ambient Air Quality Standard (USEPA 2003). Carbon monoxide does not appear to represent a health threat at the school.

Carbon dioxide

Carbon dioxide buildup is an indicator of poorly ventilated areas characterized by inadequate fresh air or inadequate air supply in buildings. There are no federal air quality standards or comparison values for carbon dioxide in air. The American Association of Heating, Refrigeration, and Air Conditioning Engineers recommends that the difference between inside and outside concentrations of carbon dioxide be less than 707 ppm (ASHRAE 1989).

Outdoor ambient concentrations of carbon dioxide normally range from 300 to 400 ppm. Carbon dioxide levels in the 33 classrooms and the front office area ranged from 620 to 1,000 parts per million (ppm) with an average of 853 ppm. The outdoor or background level of carbon dioxide was 311 ppm (HEG 2003).

Carbon dioxide levels in the classrooms and common areas did not exceed the American Association of Heating, Refrigeration, and Air Conditioning Engineers recommendations, and carbon dioxide levels in the school suggest that there is adequate ventilation within the classrooms and common areas.

Fungi

A visual inspection of 50 classrooms, common areas, and a portable building was conducted as part of the indoor air quality assessment. The report recommended replacing building materials and ceiling tiles in 16 areas that showed evidence of water damage. The Health Effects Group, Inc. also conducted air sampling for total viable and non-viable fungal spores, collecting cultures for viable fungal spores in 7 classrooms. Three outdoor air samples were taken to compare indoor and outdoor fungal levels (HEG 2003).

Table 3 presents the total spore results obtained from 7 classrooms. The results suggested that indoor levels of fungi and spores were at or below outdoor fungi levels except for 1 classroom. These data suggest that, except for 1 classroom, there are no gross sources of fungal growth that affect air quality at the school (USEPA 2001). Table 3 excludes the classroom where visible fungal growth was observed (2,467 total spores/m³). The school administration has reported that the classroom containing a source of fungus has been isolated and that the classroom will not be used until repairs are made. These repairs include repairing a roof leak and replacing the affected ceiling tile.

Table 3: Total Viable and Non-viable Fungal Spore Results

	Indoor Range	Outside Range	Indoor Level Exceeds Outdoor Level?
Total spores/m ³	226–641	400–533	No
Cultured colony forming units/m ³	<7–28	21–126	No

Food Safety & Environmental Sanitation

The Navajo County Health Department performs routine inspections of the school cafeteria and grounds as part of its environmental sanitation regulatory programs. The Blue Ridge Elementary School has complied with food safety and school grounds regulations for the last several years. There has been no evidence of repeated food safety or general sanitation violations at the school. The school appears to have adequate food safety and general sanitation procedures to protect the health of the students and staff (NCHD 2003).

Community Health Concerns

Student Attendance

Some parents have expressed concerns that the environmental conditions at the school are resulting in lower attendance rates among students. The Arizona Department of Health Services obtained the attendance records for 1996 through 2001 to determine whether there has been excessive absenteeism at the school.

School attendance records were reviewed and compared to Show Low Primary School (kindergarten–3rd grade) located in the nearby town of Show Low. Information obtained from the school administration indicates that attendance at both schools is impacted during the winter months by snowstorms and adverse road conditions. Table 4 shows that attendance rates for Blue Ridge Elementary School are comparable to Show Low Primary School and the statewide average (ADE 2003).

Table 4: School Attendance Rates

School	1996-97	1997-98	1998-99	1999-00	2000-01	5-Year Average
Blue Ridge Elementary	93%	93%	93%	94%	94%	93%
Show Low Primary	94%	94%	94%	94%	95%	94%
Statewide Average	94%	94%	94%	95%	95%	94%

Parent Satisfaction Survey

The Blue Ridge Elementary school administration conducts a parent satisfaction survey annually. The survey provides an indication of the community's perception of the quality of the school staff, services provided by the school, parent-school communications, and the overall atmosphere of the school. According to Dr. Rance Pullin, Principal, the results of the 2003 survey indicate that 99.5% of parents who returned the survey (63%) are satisfied overall with the school. Ninety percent of the parents were satisfied with the maintenance and custodial services, and 96% were satisfied with the general condition of the school facilities.

Physical Education Grounds

Some parents have expressed concerns that the physical education grounds northeast of the school buildings are located on top of a former solid waste disposal pit. Longtime residents of the area have suggested that household waste may have been placed in a ravine near the school grounds in the past. The Arizona Department of Environmental Quality has no record of any disposal facility in the vicinity of the school and the school grounds. There is no visible indication that a dump existed beneath the fields, but the presence of solid waste beneath the fields cannot be rejected without an investigation.

Child Health Concerns

This report focuses on the environmental conditions of the Blue Ridge Elementary School. ATSDR and the Arizona Department of Health Services recognize that the unique vulnerabilities of elementary school children demand special emphasis in communities faced with contamination of their water, soil, air, or food. Children may be especially susceptible to air pollution. The same concentration of pollutants can result in higher body burden in children than adults because children breathe a greater volume of air relative to their body weight.

Consequences of poor indoor air quality in schools include increasing risk of long and short-term health problems in teachers and students; a negative impact on students' ability to learn as a result of physical symptoms; increased absenteeism; reduced productivity of teachers; destruction of school equipment, including text books; and negative publicity for the school, resulting in strained relationships among teachers, parents, and administrators (EPA 2000). The air quality investigation suggested that one classroom might have fungus that could affect

children. The school has taken steps to eliminate any exposure to students and teachers and to repair the classroom.

Conclusions

Environmental conditions at the Blue Ridge Elementary School pose no apparent public health hazard. Blue Ridge Elementary School attendance rates are similar to statewide attendance rates.

Recommendations

No recommendations are indicated at this time.

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Certification

This Blue Ridge Elementary School Health Consultation was prepared by the Arizona Department of Health Services under cooperative agreement with the Agency for Toxic Substances and Disease Registry. It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated.

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The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.

Chief, SSAB, DHAC, ATSDR