Health Consultation

Evaluation of Indoor Air Data Collected at the
Roseland Elementary School

MCMINN STATE SUPERFUND SITE

SANTA ROSA, SONOMA COUNTY, CALIFORNIA

CERCLIS NO. CA0002460574

NOVEMBER 2, 2000

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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Prepared by:

California Department of Health Services
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Summary

The Public Health Officer of Sonoma County Department of Health Services requested technical support from the Environmental Health Investigations Branch (EHIB) of the California Department of Health Services (CDHS), concerning laboratory results from indoor air samples collected at the Roseland Elementary School, in the City of Santa Rosa on December 22, 1999. CDHS staff reviewed the indoor air results to ascertain whether concentrations of volatile organic compounds (VOCs) specifically measured indoors pose an immediate health risk to children and teachers of Roseland Elementary School. The content of the correspondence between Sonoma County and CDHS is the basis of this health consultation (Appendix).

Background Statement and Issues

The Roseland Elementary School is located within the McMinn Avenue State Superfund area. The McMinn area is located approximately 50 miles north of San Francisco, California, in Sonoma County, at the southwestern border of the City of Santa Rosa. In 1981, complaints of gasoline odors in drinking water initiated responses by the North Coast Regional Water Quality Control Board (NCRWQCB). Well water was tested. Analyses showed that the drinking water was contaminated with gasoline and organic chemicals [1]. The California Department of Toxic Substance Control (DTSC) initiated studies in the area in 1984, and the site was added to the State Superfund List in 1985 [1]. Subsequent investigations conducted by various agencies including the U.S. Environmental Protection Agency (USEPA), the DTSC, and the NCRWQCB, have found that the area groundwater contains petroleum products (such as gasoline and diesel fuel) and VOCs.

In 1998, Sonoma County Department of Health Services requested assistance from CDHS in evaluating the potential for exposure to soil gas migration at Roseland Elementary School. In response, CDHS/ATSDR initiated health assessment activities in the McMinn area, which have included community outreach efforts and the development of a Health Consultation that focused on indoor air contaminants at Roseland Elementary School [2].

Discussion

In January 2000, CDHS staff reviewed the indoor air data provided by the Sonoma County to determine if VOC levels pose an immediate health hazard to students and teachers at the school. CDHS also reviewed indoor air data collected from two earlier sampling events as a basis of comparison and to identify any obvious trends in the data (Appendix).

CDHS evaluated non-cancer and cancerous health effects of VOCs measured in the indoor air at Roseland Elementary School on December 20, 1999. The non-cancerous health effects were evaluated relative to comparison values called Environmental Media Exposure Guidelines (EMEGs). None of the contaminants detected in the indoor air at Roseland Elementary School exceeded health comparison values for non-cancerous health effects. Thus, these compounds are not at levels likely to cause adverse health effects, for adults or children.

Benzene and tetrachloroethylene (PCE) were evaluated for their carcinogenicity; the other compounds detected are not considered carcinogenic (Appendix). Cancer health effects are evaluated in terms of an increased risk of developing cancer, from which exposure is averaged over a lifetime. Even though benzene and PCE levels were typical of indoor air, we estimated a cancer risk for teachers at Roseland Elementary School. Qualitatively, there is a very low risk of cancer to teachers from exposure to the highest level of benzene (3.23 micrograms per cubic meter ($\mu g/m^3$)) and PCE (5.70 $\mu g/m^3$) measured indoors at Roseland Elementary School. Quantitatively, we calculated a 2.3×10^{-5} increased risk of cancer. This means that there may be a potential lifetime increased cancer risk of 2 in 100,000 exposed to the highest concentration of benzene and PCE for 30 years (length of employment), 9 months per year, 8 hours per day (time in a classroom), 5 days per week. It is important to recognize the cancer risk was based on one round of sampling. In fact, two earlier rounds of sampling did not detect benzene or PCE in the same locations (Appendix).

Based on our evaluation of the air data, the VOCs measured indoors at Roseland Elementary School appear to be consistent with levels of VOCs typically found in indoor air, and are not likely to cause adverse health effects [3]. However, these data are not sufficient to rule out a possibility of soil gas migration as a contributing source to these levels.

Children's Health Issues

CDHS and ATSDR recognize that children can be more sensitive to health effects caused by environmental contaminants. We believe that it is important to search for additional information that will increase our understanding of the contaminants, and ensure that the children's health is protected. This health consultation specifically addressed health impact to children.

Conclusions

Based on the available data, CDHS concluded that currently there is no public health hazard from indoor air, to teachers and students at the Roseland Elementary School. While the levels of VOCs measured indoors appear usual, they may reflect some soil gas migration. Thus, a soil gas investigation is warranted at Roseland Elementary School to determine the impact of potential soil gas migration to the indoor air.

It must be remembered that the strength of any conclusion is based on the strength of the data evaluated. In the case of this health consultation, there are limitations such as, the small number of samples evaluated and the limited scope of the sampling. While these limitations do not compromise the confidence in the conclusions presented in this document, the limitations and the changing subsurface conditions indicate that further study and monitoring of soil gas and indoor air at Roseland Elementary School are necessary.

Public Health Recommendations and Actions

The Public Health Recommendations and Actions Plan (PHRAP) for this site contain a description of actions taken, to be taken, or under considerations by ATSDR and CDHS at and near the site. The purpose of the PHRAP is to ensure that this health consultation not only identifies public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposures to hazardous substances in the environment. The CDHS and ATSDR will follow-up on this plan to ensure that actions are carried out.

Action Completed

1. In August 1999, CDHS/ATSDR completed a health consultation evaluating in-building air contaminants at the Roseland Elementary School.

2. CDHS responded to Sonoma County's request in January 2000 for technical assistance.

Ongoing Actions

1. CDHS will provide technical resources and support to Sonoma County, as needed.

2. CDHS will continue to keep community members aware of the CDHS and ATSDR activities in the McMinn area.

Recommendations for Further Action:

1. CDHS/ATSDR recommend that a soil gas investigation be conducted to determine if soil gas migration is impacting the indoor air at the Roseland Elementary School.

2. CDHS/ATSDR recommend continued monitoring of indoor air at Roseland Elementary School, until the soil gas pathway is investigated.

Preparers of Health Consultation

Environmental and Health Effects Assessors:

Tracy Barreau
Research Specialist
Impact Assessment contractor to the
Environmental Health Investigations Branch
California Department of Health Services

Marilyn C. Underwood, Ph.D.
Staff Toxicologist
Environmental Health Investigations Branch
California Department of Health Services

ATSDR Regional Representatives:

William Nelson
Dan Strausbaugh
Gwen Eng
Regional Representatives, Region IX
Agency for Toxic Substances and Disease Registry

ATSDR Technical Project Officer:

Tammie McRae, M.S.
Environmental Health Scientist
Division of Health Assessment and Consultation
Superfund Site Assessment Branch, State Programs Section

Certification

The Evaluation of Indoor Air at Roseland Elementary School (McMinn Site) Health Consultation was prepared by the California Department of Health Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was prepared.

Tammie McRae, MS
Technical Project Officer, SPS, SSAB, DHAC

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

Richard Gillig
Chief, State Program Section, DHAC, ATSDR

References

1. California Environmental Protection Agency, Department of Toxic Substances Control. 1995. McMinn Avenue Site. Fact Sheet Number 7.

2. U.S. Environmental Protection Agency. Indoor Air Quality in Public Buildings: Volume I. Office of Modeling, Monitoring Systems and Quality Assurance. August 1988.

3. California Department of Health Services, Environmental Health Investigations Branch. Public Health Assessment, Advanced Micro Devices Inc., Sunnyvale, California. September 16, 1993.

Appendix

Letter to Sonoma County Department of Health Services
from the California Department of Health Services
January 25, 2000.

DEPARTMENT OF HEALTH SERVICES
1515 CLAY STREET, SUITE 1700
OAKLAND, CA 94612
(510) 622-4500

January 26, 2000

Mary Maddux Gonzales, M.D.
Sonoma County Health Officer
3313 Chanate Road
Santa Rosa, CA 95404

Dear Dr. Maddux Gonzales:

On January 19, 2000 the Environmental Health Investigations Branch (EHIB) of the California Department of Health Services (CDHS) was asked by Sonoma County Department of Health Services to review indoor air quality data collected at Roseland School, by PES Environmental on December 22, 1999. The Roseland School is located within the McMinn Avenue State Superfund area. As part of our cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), we have been involved with this site. We have been working with the North Coast Regional Water Quality Control Board (RWQCB), and have previously reviewed indoor air quality data collected by the United States Environmental Protection Agency (USEPA), Region IX.

The main objective of our review is to answer the following two questions: 1) are the VOC levels measured at Roseland School typical of indoor air and 2) are VOC levels at Roseland School a health concern?

Are the VOC Levels Measured at Roseland School Typical of Indoor Air?

Buildings are an enclosed space, and generally indoor air contains higher levels of chemicals than outdoors. Typical indoor air is not healthy and contains many chemical constituents from various sources, such as household chemicals, cooking, building materials, and influences from the outdoors. Schools also contain chemicals in the indoor air. EHIB staff have been part of several investigations at schools and found that they generally have lower levels of chemicals in the indoor air compared to the average household, but still contain measurable amounts of various chemicals.

In the early 1990's EHIB conducted an investigation at a school in Silicon Valley, which is similar in nature to the Roseland School with regards to groundwater contamination beneath the school. The target VOCs (TCE, PCE, TCA, DCE, and vinyl chloride) were measured in indoor air at the school. Benzene was not a contaminant detected in the groundwater beneath the school; however, because benzene is typically found indoors it was also quantified. As expected, benzene was detected in the indoor air during the study. We have included the range of VOCs measured during EHIB's investigation as a means of comparison (please see attached Table 1).

Another study conducted by the USEPA focused on indoor air quality in public buildings (including a school). The main goals of the study were to measure VOCs, air exchange rates, and emission rates of building materials and cleaning operations. We have included the average concentrations of the VOCs measured indoors, as another source for comparison (please see attached Table 1).

Taking into account all the factors discussed above, CDHS reviewed the indoor air data collected at the Roseland School on December 22, 1999. We also reviewed and included the indoor air results from the USEPA sampling in June 1998 and the results from sampling conducted by the RWQCB in July 1999 (please see attached Table 1.) The December 1999 data were collected from four rooms, eight soil gas locations, and one outdoor location as a measure of ambient air. The sampling protocol followed was the same used during the USEPA sampling in June 1998. Overall, the indoor air concentrations appear to be consistent between sampling locations, and with earlier sampling events. However, benzene and tetrachloroethylene (PCE) were detected in the indoor air during the December 1999 sampling, and not during the two earlier sampling events.

All of the VOCs, including benzene and PCE seem to be consistent with levels found in indoor air and ambient air in general. The fact that benzene was measured in outdoor ambient air at levels (4.03 $\mu g/m^3$) consistent with the indoor samples further supports this assertion. However, these data are not sufficient to rule out the possibility of soil gas migration as a contributing source to these levels. It is worth noting that there are gas stations to the north, east, and west, all within 400 feet of Roseland School, which may also be contributing to the benzene levels in the outdoor air.

Are the VOC Levels at Roseland School a Health Concern?

CDHS evaluated the non-cancer and cancer health effects of the indoor air at Roseland based on the data collected in December 1999. Health comparison values are used to evaluate non-cancer health effects. Comparison values are media-specific concentrations that have been derived by the Agency for Toxic Substances and Disease Registry (ATSDR), which allow an investigator to screen contaminants for further evaluation. Contaminant concentrations that exceed health comparison values are evaluated further. If contaminant concentrations do not exceed health comparison values, then the contaminant is not likely to pose a health threat, and the contaminant is not evaluated further.

The non-cancer health effects were evaluated relative to comparison values called Environmental Media Exposure Guidelines or EMEG values. None of the contaminants detected in the indoor air at Roseland School exceed health comparison values for non-

cancer health effects. Thus, these compounds are not at levels likely to cause adverse health effects.

Benzene and PCE are evaluated for their carcinogenicity; the other compounds detected are not considered carcinogenic. Cancer health effects are evaluated in terms of an increased risk of developing cancer, from which exposure is averaged over a lifetime. Even though benzene and PCE levels were typical of indoor air, we estimated a cancer risk for teachers at Roseland School. Qualitatively, there is a very low risk of cancer to teachers from exposure to the highest level of benzene (3.23 $\mu g/m^3$) and PCE (5.70 $\mu g/m^3$) measured indoors at Roseland School. Quantitatively, we calculated a 2.3×10^{-5} increased risk of cancer. This means that there may be a potential lifetime increased cancer risk of 2 in 100,000 people exposed to the highest concentration of benzene and PCE for 30 years (length of employment), 9 months per year, 8 hours per day (time in classroom), 5 days per week. The cancer risk estimated here does not account for the risk of cancer received at home and from other sources outside of Roseland School.

It is important to recognize the cancer risk was based on one round of sampling, and in fact two earlier rounds of sampling did not detect benzene or PCE in the same locations. For additional perspective, the USEPA conducted a study that evaluated personal exposure to 25 VOCs, common to residential indoor air. The study cited the average daily exposure to benzene in indoor air at 13 $\mu g/m^3$, which is over five times higher than the benzene levels measured at Roseland School. The average daily exposure to PCE was cited at 6.8 $\mu g/m^3$, which is about 15% higher than the levels measured at Roseland School.

CDHS does not generally estimate cancer risk for children mainly because toxicological data is developed using adult animal studies. However, if a cancer risk was estimated using cancer potency factors derived for an adult, the cancer risk would be less than the risk derived for a teacher at Roseland School. CDHS recognizes that children can be more sensitive to health effects caused by environmental contaminants and believe that it is important to search for additional information that will increase our understanding of the contaminants, and ensure that the children's health is protected.

In summary, based on the available data CDHS has determined that the contaminants measured in the indoor air are not at a level likely to cause adverse health effects. CDHS estimated a very low increased risk of cancer from exposure to benzene and PCE. However, the risk estimated is not unusual for what is considered typical exposure to indoor air. While the levels of VOCs measured indoors do not appear unusual, they may reflect some soil gas migration. Given the nature of the groundwater contamination a soil gas investigation seems warranted. Also, regular monitoring of

indoor air at Roseland School should continue until the soil gas investigation has determined that there is little or no migration of contaminants into the buildings.

In closing we thought you might find the attached "Action Levels for Air Sampling" table helpful. This table was developed by the EHIB investigators to use for the indoor air investigation at the school in Silicon Valley described previously in this letter. Please note, the values in the attached table are expressed in ppbv (parts per billion volume).

If you have any questions or comments please do not hesitate to contact Tracy Barreau at (510) 622-4489 or Marilyn Underwood, Ph.D. at (510) 622-4415.

Sincerely,

Tracy Barreau
Research Specialist
Environmental Health Investigations Branch

Marilyn C. Underwood, Ph.D.
Staff Toxicologist
Environmental Health Investigations Branch

cc:
J.J. Krug
Sonoma County Environmental Health
Environmental Health Division
1030 Center Drive, Suite A
Santa Rosa, CA 95403

Bill Erdei
California Regional Water Quality
Control Board
5550 Skylane Boulevard, Suite A
Santa Rosa, CA 95403

Damien O'Bid
California Regional Water Quality
Control Board
5550 Skylane Boulevard, Suite A
Santa Rosa, CA 95403

Jay Jasper
Sonoma County Water Agency
P.O. Box 11628
Santa Rosa, CA 95406-1628

Dan C. Strausbaugh, M.P.H.
Regional Representative
ATSDR, Agency for Toxic Substances
And Disease Registry
75 Hawthorne Street
Suite 100, Mail Stop HHS-1
San Francisco, CA 94105

Table 1. VOCs Measured at Roseland School, a Silicon Valley School, and in a USEPA Indoor Air Study

	Indoor Air at Roseland School (sampled 12/99)	**Indoor Air at Roseland School** (sampled 7/99)	**Indoor Air at Roseland School** (sampled 7/98)	**Indoor Air at a School in Silicon Valley** [1]	**VOCs in Public Buildings** [2]
Compounds	Range of Concentrations	Range of Concentrations	Range of Concentrations	Range of Concentrations	Mean Concentrations
1,1,1-Trichloroethane	<2.73 -5.62 $\mu g/m^3$ (<0.50 - 1.03 ppbv)	not detected	not detected	5.62 - 13.4 $\mu g/m^3$ 1.03 - 2.46 ppbv	23.0 $\mu g/m^3$ 4.21 ppbv
Benzene	2.62 - 3.23 $\mu g/m^3$ 0.82 - 1.01 ppbv	not detected	not detected	2.56 - 12.1 $\mu g/m^3$ 0.80 -3.80 ppbv	9.20 $\mu g/m^3$ 2.88 ppbv
Freon 11	<2.81 - 33.2 $\mu g/m^3$ (<0.50- 5.11 ppbv)	nd - 23.6 $\mu g/m^3$ (nd - 4.2 ppbv)	68.3 - 102.5 $\mu g/m^3$ (12 -18 ppbv)	not measured	not measured
Freon 12	3.86 - 8.95 $\mu g/m^3$ (0.78 - 1.81 ppbv)	nd - 5.4 $\mu g/m^3$ (nd - 1.1 ppbv)	not detected	not measured	not measured
Toluene	7.91 - 12.1 $\mu g/m^3$ (2.10 - 3.20 ppbv)	nd - 12.1 $\mu g/m^3$ (nd - 3.2 ppbv)	8.8 - 11.9 $\mu g/m^3$ (2.3 - 11.9 ppbv)	not measured	not measured
Tetrachloroethylene (PCE)	<3.39 - 5.70 $\mu g/m^3$ (<0.50- 0.84 ppbv)	not detected	not detected	0.34 -0.88 $\mu g/m^3$ 0.05 - 0.13 ppbv	6.40 $\mu g/m^3$ 0.94 ppbv
Ethylbenzene	<2.17 - 4.73 $\mu g/m^3$ (<0.50 - 1.09 ppbv)	nd - 7.4 $\mu g/m^3$ (nd - 1.7 ppbv)	not detected	not measured	3.70 $\mu g/m^3$ 0.85 ppbv
Xylene (o)	<2.17 - 3.86 $\mu g/m^3$ (<0.05 - 0.89 ppbv)	nd - 14.3 $\mu g/m^3$ (nd - 3.3 ppbv)	not detected	not measured	4.80 $\mu g/m^3$ 1.11 ppbv
Xylene (m&p)	6.30 - 15.3 $\mu g/m^3$ (1.45 - 3.52 ppbv)	nd - 39.9 $\mu g/m^3$ (nd -9.2 ppbv)	4.4 - 7.1 $\mu g/m^3$ (1 -1.6 ppbv)	not measured	10.0 $\mu g/m^3$ 1.11 ppbv
1,2,4 - Trimethylbenzene	<2.46 - 3.34 $\mu g/m^3$ (<0.05 - 0.68 ppbv)	nd - 12.2 $\mu g/m^3$ (nd - 2.8 ppbv)	not detected	not measured	not measured

(1) Data Source: CDHS/EHIB 1992

(2) Data Source: USEPA 1988

Concentrations presented in $\mu g/m^3$ (micrograms per meter cubed) and ppbv (parts per billion volume)

nd: not detected at laboratory's reporting limit

ACTION LEVELS FOR AIR SAMPLING

INTERPRETATION OF CONCENTRATIONS (PPBV) AND ACTION RECOMMENDED	TCE	PCE	Vinyl Chloride	1,1-DCE	1,2-DCE	1,1,1-TCA	Benzene	Ethyl Benzene	Styrene	Xylenes
Level I. Concentrations found within this range are considered typical for indoor environments. No further action recommended.	< 5.00	< 4.00	< 0.00	< 1.00	?	< 20.00	< 12.00	< 10.00	< 5.00	< 10.00
Level IIa. Concentrations found within this range are considered typical for indoor environments. Maximum exposure to these concentrations may lead to adverse health effects. Additional sampling under typical conditions may be warranted.	> 3.05 & < 5.00			>0.46 & < 1.00			> 3.28 & < 12.00			
Level IIb. Concentrations within this range are elevated compared to a typical indoor environment. These concentrations are not necessarily associated with adverse health effects. Repeat sampling with further sampling refinement such as daytime/nightime sampling; more sampling locations within the school.		4.01 - 12.50	0.2 - 2.0			20.01 - 300.00		10.01 - 300.00	5.01 - 50.00	10.01 - 100.00
Level III. Concentrations within this range are elevated compared to a typical indoor environment. Exposure to these concentrations may lead to adverse health effects. Discontinue use of school. Conduct extensive sampling in school to confirm results. If concentrations are confirmed, immediate remedial action should be taken to reduce levels to the Level III range. Sample in nearby homes and control homes.	> 5.00	>12.5	>2.00	>1.00	>200.00	> 300.00	>12.00	>300.00	>50.00	>100.0