Letter Health Consultation

Evaluation of Domestic Well Water Samples

BOARD CAMP
BOARD CAMP, ARKANSAS

Prepared by the
Arkansas Department of Health

JULY 30, 2009

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners 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 or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

Evaluation of Domestic Well Water Samples

BOARD CAMP
BOARD CAMP, ARKANSAS

Prepared By:

Arkansas Department of Environmental Quality
Regulated Storage Tanks Division
The Arkansas Department of Health
Epidemiology Division
Under a Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Arkansas Department of Health

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Governor Mike Beebe
Paul K. Halverson, DrPH, FACHE, Director and State Health Officer

July 7, 2009

Mr. Joe Hoover
Chief, Regulated Storage Tanks Division
Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, AR 72118-5317

Dear Mr. Hoover:

In response to a request from the Arkansas Department of Environmental Quality (ADEQ) Regulated Storage Tanks Division (RSTD), the Arkansas Department of Health (ADH) Epidemiology Division has evaluated domestic water well samples from Board Camp, AR, taken in June 2009 [1]. The elevated contaminants of concern (COCs) identified in this domestic well data are benzene, ethylbenzene, and methyl-tert-butyl ether (MTBE). Under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), ADH has prepared this letter to determine if a public health hazard exists due to the levels of COCs detected.

Background

As described to ADH, this is a state-lead site at ADEQ, which began in the 1990's when a private citizen called to report a gasoline-like odor and taste in his residential well. The source was traced to an unregistered underground storage tank (UST) which leaked gasoline. At the time several residents of Board Camp, AR, were using domestic wells as their sole source of drinking water. ADEQ sampled the domestic wells of residences, a general store, and a volunteer fire department surrounding the leaking tank. MTBE was detected, monitoring wells were installed, and a rural water district hook-up was provided for the residents to utilize. During that time, the domestic water wells were only disconnected, rather than being plugged and abandoned.

Statement of Issues

ADH responded to a phone request from your offices on July 6, 2009. The domestic well data taken in June 2009 was sent the same day via e-mail. A subsequent phone call to the ADEQ RSTD project manager revealed that these domestic wells in Board Camp have been monitored since the 1990's, and today all the residents have access to the public water supply for their drinking water. During our phone conversation (on July 7, 2009), it was stated that ADEQ believes there is still free product in the contaminated plume surrounding these domestic wells, and that some of the residents have re-connected the lines to these domestic wells. Although these domestic wells are not thought to be the residents' sole source of drinking water, some of the COC concentrations found in the data raise a public health concern. At this point it is unconfirmed as to whether or not anyone is drinking from the domestic wells. Therefore, ADH concurs with ADEQ's time-sensitive decision to inform the owners of the domestic wells that they should either plug and abandon the wells or disconnect and discontinue their use, depending on their level of contamination and the proximity of the plume.

Discussion

Exposure to COCs is determined by examining human exposure pathways. An exposure pathway has five parts:

1. A source of contamination (e.g., hazardous compound(s) in the groundwater as a result of the UST leak),
2. An environmental medium such as water, soil, or air that can hold or move the contamination,
3. A point at which people come in contact with a contaminated medium,
4. An exposure route, such as ingestion of the well water or skin contact, and
5. A population who could come in contact with the contaminants.

An exposure pathway is eliminated if at least one of the five parts is missing and will not occur in the future. For a completed pathway, all five parts must exist and exposure to a contaminant must have occurred, is occurring, or will occur. For this evaluation, a complete pathway has been identified, since there is documented data of contaminated well water that the residents of Board Camp have used in the past as drinking water and are still using as a water source.

The COCs found in the data we received are benzene, ethylbenzene, and MTBE, which are all components of gasoline. According to the ATSDR ToxFAQs reference, eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, or possibly death in large concentrations. The major effect of benzene from long-term exposure is on the blood. Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection. Long-

term exposure to high levels of benzene in the air can cause leukemia, a cancer of the blood forming organs. The Department of Health and Human Services (DHHS) has determined that benzene is a known carcinogen [2].

Although ethylbenzene and MTBE have not been classified as carcinogens, health effects such as throat irritation and dizziness are similar to benzene [3]. Animal studies also suggest that drinking MTBE may cause gastrointestinal irritation, liver and kidney damage, and nervous system effects [4].

From the domestic well water data collected in 2009, six samples contained benzene, ethylbenzene, or MTBE at elevated levels (See Table 1). After using standard health comparison screening values, further risk calculations were done on those sample concentrations that were higher than these screening values. For benzene, the screening value is the U.S. Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL) of 5 parts per billion (ppb). For ethylbenzene, the screening value is an EPA MCL of 700 ppb.

Because MTBE has not been assigned a MCL, EPA has issued guidelines recommending that, to protect children, drinking water levels of MTBE not exceed 4,000 ppb for an exposure of one to ten days, and 3,000 ppb for longer-term exposures [4]. Therefore, the ATSDR Environmental Media Evaluation Guide (EMEG) of 3,000 ppb for a child and 10,000 ppb for an adult were used in this evaluation. EMEGs represent concentrations of substances in water, soil, and air to which humans may be exposed during a specified period of time without experiencing adverse health effects. Water EMEGs are derived for potable water used in homes. Substances found at concentrations below EMEGs are not expected to pose public health hazards [5]. Since the data indicated no MTBE concentrations above these EMEGs, no further evaluation was warranted.

Samples of elevated benzene and ethylbenzene were found to be at higher concentrations than the screening values; therefore, further calculations were needed to evaluate the possible public health risks. Using the exposure pathway of ingestion for children and adults, a daily exposure dose was found using the EPA standard scenario of a child (16 kilogram body weight) ingesting a liter per day for 365 days or of an adult (70 kilogram body weight) ingesting two liters per day for 365 days. A hazard quotient (HQ) was then found using the calculated exposure dose and the compound's reference dose (RfD).

An HQ is the average daily intake divided by a chemical specific RfD. EPA Region 6 Human Health Medium Specific Screening Level (HHMSSL) for each COC was the source for the RfD. If the HQ for a chemical is equal to or less than one, it is believed that there is no appreciable risk that non-cancer health effects will occur. If the HQ exceeds one, there is some possibility that non-cancer effects may occur, although an HQ above one does not indicate an effect will definitely occur. This is because of the margin of safety inherent in the derivation of all RfD values. The larger the HQ value, the more likely it is that an adverse effect may possibly occur. Please see the enclosed **Table 1** for the HQ values for all receptors to each COC that exceeded screening values. The HQ was greater than one for benzene in three domestic well samples.

Conclusion

Based on the findings from the domestic well data, ADH/ATSDR has determined that two separate public health hazard categories are needed. For the domestic wells that had elevated concentrations of benzene, exposure to this water through ingestion necessitates a ***public health hazard*** category due to the current exposure, past exposure to residents as the primary drinking water source, the toxicity characteristics of the COC, and the high HQ values which indicate potential risks of adverse health effects. This category applies to sites that have certain physical hazards or evidence of chronic (more than one year), site-related exposure to hazardous substances that could result in adverse health effects.

Domestic wells that had elevated concentrations of ethylbenzene or MTBE pose ***no apparent public health hazard*** since exposure to the levels detected is not likely to result in adverse health effects. This category is applied to sites where exposure to site-related contaminants might have occurred in the past or is still occurring, but the exposures are not at levels likely to (or known to) cause adverse health effects.

Recommendations

For the wells under the "public health hazard category" due to the high levels of benzene present, ADH/ATSDR recommends that these wells be plugged and abandoned, as proposed by ADEQ. As a prudent public health practice, ADH/ATSDR recommends that the domestic wells under the "no apparent public health hazard category" be disconnected and discontinued for use (as proposed by ADEQ), assuming the wells are not the only drinking water source. Even though there is not strong evidence of adverse public health effects from the MTBE, this would serve as a precautionary public health practice to address the ADEQ concern regarding possible free product thought to be in the groundwater. It is also recommended that this public health consultation be used as a guide to offer public health information and education to the residents or owners of the domestic wells in Board Camp, AR, affected by groundwater contamination in this matter.

References

1. Arkansas Analytical Inc.; Board Camp Analyses Results, SDG Number: 0906164. June 18, 2009.
2. Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs for Benzene. Available at: http://www.atsdr.cdc.gov/tfacts3.html. Accessed July 7, 2009.
3. Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs for Ethylbenzene. Available at: http://www.atsdr.cdc.gov/tfacts110.html. Accessed July 7, 2009.

4. Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs for Methyl-tert-butyl ether (MTBE). Available at: http://www.atsdr.cdc.gov/tfacts91.html. Accessed July 7, 2009.
5. Agency for Toxic Substances and Disease Registry (ATSDR) Public Health Assessment Guidance Manual (Update). U.S. Department of Health and Human Services; Atlanta, GA. January 2005.

Thank you for allowing ADH/ATSDR the opportunity to work with your agency on this issue. Please feel free to contact me at 501-280-4041 or Ashley.Whitlow@arkansas.gov, if you have any questions regarding this letter. Please contact us again once a decision has been reached as to the best method of informing the domestic well owners, so we may assist in the public health information and education for residents in Board Camp, AR.

Sincerely,

Ashley Whitlow, M.S.
ADH Epidemiologist/ATSDR Health Assessor
Environmental Epidemiology

Enclosure

cc: Lori Simmons, M.S., Section Chief for Environmental Epidemiology, ATSDR Program Manager, ADH
Carrie Poston, B.S., CHES, ATSDR Public Health Education Supervisor, ADH
Kay McQueen, Ph.D., Geologist, RSTD, ADEQ
Marshall Hatfield, PE, Engineering Division, ADH

Table 1. Board Camp, AR Domestic Well Water Samples (Collected June 2009)

Sample Name	Compound	Concentration ppb	Screening Value	HQ Ingestion Calculation Child (1 liter per day)	HQ Ingestion Calculation Adult (2 liters per day)
[redacted]	Methyl-tert-Butyl Ether (MTBE)	6.55		N/A	N/A
[redacted]	Methyl-tert-Butyl Ether (MTBE)	29.8	ATSDR Drinking Water CV = 3,000 ppb child *or* 10,000 ppb adult	N/A	N/A
[redacted]	Methyl-tert-Butyl Ether (MTBE)	22.3		N/A	N/A
VFD	Methyl-tert-Butyl Ether (MTBE)	196		N/A	N/A
VFD	Benzene	143	MCL = 5 ppb	**2.23**	**1.03**
[redacted]	Methyl-tert-Butyl Ether (MTBE)	51.6	ATSDR Drinking Water CV = 3,000 ppb child *or* 10,000 ppb adult	N/A	N/A
[redacted]	Benzene	183	MCL = 5 ppb	**2.75**	**1.3**
[redacted]	Benzene	2050	MCL = 5 ppb	**32.5**	**14.75**
[redacted]	Ethylbenzene	1310	MCL = 700 ppb	0.82	0.37
[redacted]	Methyl-tert-Butyl Ether (MTBE)	111	ATSDR Drinking Water CV = 3,000 ppb child *or* 10,000 ppb adult	N/A	N/A

Calculated values in bold exceed the HQ target value of 1.0.

ppb = parts per billion (*or* micrograms per liter); VFD = Volunteer Fire Department; ATSDR = Agency for Toxic Substances and Disease Registry; CV = Comparison Value; MCL = Maximum Contaminant Level; HQ = Hazard Quotient; N/A = Not Applicable

Certification

The Arkansas Department of Health prepared this letter health consultation for Board Camp, Arkansas, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodology and procedure existing at the time the health consultation was initiated. Editorial review was completed by the cooperative agreement partner.

Jeff Kellam, M.S.
Technical Project Officer
Division of Health Assessment and Consultation (DHAC)
ATSDR

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

Alan W. Yarbrough
Cooperative Agreement Team Leader, DHAC, ATSDR