ATSDR Record of Activity/ Technical Assist

UID #: IBD7 Date: 12/28/2011 Time: 12:00 am pm X

Site Name: Dimock Area City: Dimock State: Pennsylvania

CERCLIS #:_____ Cost Recovery #: 3ATA00 Region: 3

Site Status (1) NPL Non-NPL RCRA Non-Site specific Federal
(2) Emergency Response Remedial Removal Other

Activities

Incoming Call	Public Meeting*	X Health Consult*	Site Visit*
Outgoing Call	Other Meeting	Health Referral	Info Provided
X Conference Call	X Data Review	Written Response	Training
Incoming Mail	Other		

Requestor: Jon Capacasa, EPA Region 3 Water Protection Division

NARRATIVE SUMMARY

On December 7, 2011, EPA Region 3 requested ATSDR conduct an evaluation of available Dimock private well data, stating that "residents are potentially in contact through dermal, inhalation and ingestion pathways, if you should identify any potential health threats please notify us as soon as possible." In order to conduct an immediate preliminary evaluation of the large data set as requested by EPA, on December 9, 2011, ATSDR Region 3 requested support from ATSDR Emergency Response in Atlanta. Home owners and numerous other concerned citizens contacted EPA and ATSDR in November 2011 asking for help in evaluating the well sampling data and requesting that alternative supplies of drinking water continue to be supplied to the residents. Following the residents' request, EPA acquired a large amount of summarized data tables regarding the Dimock site concern. After communicating with PADEP, EPA and ATSDR visited the Dimock homes along Carter Road and State Route 3023 on November 10, 2011 and were provided a large amount of well data. Based on the home visits and preliminary review of data, EPA and ATSDR raised the following concerns: the reliability of methane removal systems; the presence of other contaminants besides methane (metals, volatile organics and non-naturally occurring organics) for which the well treatment systems are not designed or in place to address; and homes/wells in Dimock that may have never been tested and may be contaminated. The multiple sampling efforts at this site to date were conducted by PADEP and private contractors not affiliated with EPA.

The site area is located in Dimock, a rural area of northeastern Pennsylvania in Susquehanna County. A map of the area is included as Attachment 1. Cabot began natural gas drilling in the Dimock area in 2008. Methane contamination was detected in private wells soon thereafter. The Pennsylvania Department of Environmental Protection (PADEP) has had the lead in investigating the environmental complaints in Dimock. After first

calling for the provision of public water, which the State Public Utility Commission vetoed based on cost and feasibility, in November 2009 (last amended December 2010), PADEP issued a consent agreement with Cabot for methane and metals removal systems for eighteen private wells in the site area. The agreement calls for each well owner to enter into the agreement with Cabot. Until the treatment systems are installed, Cabot was to provide delivered water. There are eighteen wells that are part of the PADEP/Cabot agreement. Six well owners have signed agreements and have systems installed. However, most of them are buying bottled water because they do not have confidence that the treatment systems are working. Twelve well owners have not signed the agreement and are part of a civil suit. These 12 owners were being provided delivered water by Cabot. However on November 30, 2011, Cabot ceased delivering water to these homes.

PADEP approved the stoppage of water delivery scheduled for November 30, 2011 on the grounds that Cabot has allowed sufficient time for residents to sign the agreement and that a remedy for home owners has been provided. However, other private wells appear to exist in the site area. The exact number of these other private wells has not been confirmed by EPA or ATSDR at this time. These additional wells are not part of the existing PADEP/Cabot agreement, and very little if any sampling data are currently available for these wells.

DISCUSSION

ATSDR Division of Regional Operations received the water sampling data for the 18 properties that are part of the consent order between Cabot and PADEP. This information was provided to EPA and ATSDR Division of Regional Operations from PADEP and the legal representative for some of the residents. ATSDR Division of Regional Operations prepared a summary of this information for ATSDR Emergency Response. The data package provided to ATSDR Emergency Response for this review consisted of maximum concentrations reported over numerous sampling events over several years. It is not possible from this summary to evaluate the changes in conditions over time or determine if there is any potential synergism from the chemicals involved. Note, it is fairly unusual for metal contamination to be detected in field blanks, as was documented in the summary sampling data provided. Therefore, the quality control of the field sampling methods needs to be further evaluated. At this time, the full quality assurance/quality control information for these sampling data has not been provided to EPA or ATSDR.

Based on the maximum results for the approximately 18 wells sampled, levels of coliform bacteria, methane, ethylene glycol, bis(2-ethylhexyl) phthalate (DEHP), 2-methoxyethanol, aluminum, arsenic, lithium, manganese, sodium, and iron were elevated above comparison values (CVs).

<u>Bacteriological/Coliform Results</u>

CDC/NCEH (National Center for Environmental Health) reviewed the summary sampling results for bacteriological contamination. The review of the coliform data concluded that bacteria were detected in 9 of the 18 private wells. Any detection of coliform in drinking

water supplies is of potential health concern. Total coliform bacteria are "indicators" used to determine if a pathway exists that might allow disease-causing bacteria to contaminate the water supply. E. coli bacteria are a subset of coliform bacteria that only occur in animal or human wastes and indicate more serious contamination. The coliform results were particularly elevated in five of the wells (in two cases noted by the laboratory as too high to count). Prior studies of private well water in Pennsylvania have found that approximately one third of private wells have total coliform detections Higher incidences of total coliform bacteria have been found in the southeast and southwest regions of Pennsylvania, while the lowest incidence was observed in the northwest and northeast regions (Swistock et al 2009).

Combustible Gas Results

In the summary data set provided, methane levels ranged from 79 µg/L dissolved in water to 64,300 µg/L dissolved in water. A level of 28,000 µg/L methane dissolved in water was used as a comparison level for the methane detections in these private wells. This level is based on the recommended action levels (RALs) from the Department of the Interior Office of Surface Mining Reclamation and Enforcement (DOI 2001). Elevated concentrations of methane can produce explosive environments. Additional combustible gases, including butanes, propane, ethane and ethene were also identified in many of the well sample results. Of the approximately 18 private wells in this data set, ten had maximum dissolved methane levels higher than 28,000 ug/L. Methane venting systems were offered to the 18 properties that are part of the Cabot/PADEP order. ATSDR and EPA do not have precise information at this time about which of the approximately 18 private wells for which sampling data are available have functioning methane venting systems at this time.

Methane is a simple asphyxiant (at around 87% by volume). Asphyxiants displace oxygen from air primarily in enclosed spaces. This can result in insufficient oxygen in the blood and eventual asphyxiation. Exposure to low oxygen environments (such as resulting from methane displacement) produces symptoms of central nervous depression, including nausea, headache, dizziness, confusion, fatigue, and weakness.

Organic Chemical Detections

Not all the private wells in this data set were analyzed for organic constituents. For the subset of these private wells that did have organic analyses conducted, a number of organic compounds were detected. These organic detections included glycols and phthalates, both used extensively in the natural gas field. Glycol detections included ethylene glycol, triethylene glycol, and 2,2'oxybisethanol (diethylene glycol). For ethylene glycol, ATSDR has identified an intermediate exposure duration (14 days to 364 days) drinking water ingestion CV of 8,000 µg/L for children and 30,000 µg/L for adults. EPA has identified an ethylene glycol lifetime health advisory (LTHA) value of 14,000 µg/L. Some wells had all three reported glycols present in their wells, including ethylene glycol, triethylene glycol and 2,2'oxybisethanol.

All of the glycol sampling detections (with the exception of the maximum ethylene glycol result of 8,410 ug/L) were data qualified with a "J" indicating the presence of the compound was confirmed but the concentration was estimated. These data qualifiers are likely a result of the difficulties in laboratory analysis for this class of compounds.

It is important to note that the maximum ethylene glycol result (8,410 ug/L) in this data set was from a sample collected after the treatment system on this private well. This maximum post-treatment ethylene glycol result exceeds the ATSDR child intermediate CV of 8,000 µg/L, but is below the EPA LTHA of 14,000 µg/L. It should also be noted that four additional samples may have exceeded the ATSDR EMEG of 8,000 µg/L with sample results indicated in the data package as less than 10,000 µg/L. Ethylene glycol is used to make antifreeze and de-icing solutions for cars, airplanes, and boats. It is also used in hydraulic brake fluids and inks used in stamp pads, ballpoint pens, and print shops.

Bis(2-ethylhexyl) phthlate (DEHP) is a manufactured chemical that is commonly added to plastics to make them flexible. DEHP is not toxic at the low levels usually present in the environment. In animals, high levels of DEHP can damage the liver and kidney and affect the ability to reproduce. Bis(2-ethylhexyl) phthalate (DEHP) was detected in five samples and ranged from 0.14 µg/L to 22 µg/L . These levels did not exceed the chronic health comparison values for non-cancer health effects; however four of the 5 samples exceeded the drinking water comparison value of 2 µg/L (ATSDR Cancer Risk Evaluation Guide (CREG) and one sample exceeded the EPA Maximum Contaminant Level (MCL) for public drinking water supplies for this chemical of 6 ug/L. A drinking water concentration of 22 µg/L would result in an exposure dose for an adult of 0.00063 mg/kg/day and 0.0022 mg/kg/day for a child.

Estimated 2-methoxyethanol concentrations (ranging from 880 µg/L to 1,300 µg/L) were detected in each of six wells assessed for this chemical, although all results were "J" qualified as estimated results. Each of these estimated results exceed the EPA Risk Screening Level (RSL) for 2-methoxyethanol of 110 µg/L. 2-Methoxyethanol is mainly used as a solvent and is found in the glycol ethers class. It is also used as an additive in deicing solutions.

Inorganic Chemical Detections

Aluminum was detected in each of the approximately 18 wells sampled, ranging from under 10 µg/L up to 44,100 µg/L. The two wells with the highest aluminum concentrations (13,700 µg/L and 44,100 µg/L) exceeded the ATSDR CV for chronic exposures (greater than 364 days) to children, set at 10,000 µg/L. The well with the maximum aluminum concentration (44,100 ug/L) also slightly exceeds the adult health-based CV for chronic exposures (40,000 µg/L).

Arsenic was detected in all of the wells, ranging from 0.67 µg/L to 37 µg/L. The two highest levels of arsenic detected were 37 µg/L and 25 µg/L; these were the only two arsenic concentrations that exceeded EPA's Maximum Contaminant Level (MCL) for this chemical in public drinking water supplies. The arsenic concentrations in approximately

12 of the samples from this data set were above the ATSDR Child EMEG (Environmental Media Evaluation Guide) of 3.0 µg/L for non-cancer effects. Arsenic has been classified as a known human carcinogen. This classification is based on animal and human studies which indicate an increased risk for developing cancers of the skin, lung, bladder, kidney, liver, and prostate from consuming water containing arsenic. All of the arsenic detections in the wells exceeded the estimated lifetime 10E-6 cancer risk level from exposure of 0.02 µg/L. A "B" data qualifier indicating this contaminant was also detected in blank quality control samples was assigned to four of the lower arsenic sampling results (ranging from 0.67-7.2 ug/L) in this summary.

Seven samples indicated lithium at concentrations ranging from 8.3 µg/L to 380 µg/L. Five of the 7 samples were above the child provisional Reference Dose Media Evaluation Guide (RMEG) of 20 µg/L. Therapeutically, lithium (lithium carbonate) is used to control manic episodes in manic depressive illness in doses of 900 to 1,800 mg/day. The estimated lithium intakes at the maximum concentrations at this site are well below reported therapeutic levels.

Manganese concentrations in the well water samples ranged from 2.4 µg/L to 1,920 µg/L. Although the concentrations of manganese in all but two of the samples in this data summary are greater than EPA's secondary drinking water standard for this contaminant (50 µg/L), this standard was set for aesthetic reasons and is not health based. Ten of the wells had maximum results exceeding EPA's health advisory level for manganese of 300 ug/L. Manganese is an essential mineral that occurs naturally; however excess exposure can cause health effects that include behavioral changes and other nervous system effects.

Sodium levels exceeded EPA's Drinking Water Advisory levels of 20,000 µg/L in ten of the samples. The highest concentration was detected at 131 mg/L. Drinking water from these wells would increase the amount of sodium consumption in a person's diet. This could be particularly problematic for sodium sensitive individuals.

Iron concentrations were found greater than EPA's secondary drinking water standard for this contaminant (300 µg/L) in 16 of the samples. This standard was set for aesthetic reasons and is not health based. The maximum level of iron in this data set was 24,100 ug/L, and this result is from a private well that is not known to have any treatment systems. At the levels detected, the taste of the water will be affected. Iron is an essential mineral with recommended average intakes of 8 mg/day for men and post-menopausal women, 18 mg/day for pre-menopausal women, 10 mg/day for adolescents, and 27 mg/day for pregnant women. The Institute of Medicine Upper Tolerable Intake Level (UL) for iron is 45 mg/day. Drinking water from the well with the highest level of iron would add approximately 48.2 mg of iron to an adult's daily diet and add approximately 24.1 mg of iron to a 10-16 kg child's daily diet.

CONCLUSIONS

These sample results indicate that there is a possible chronic public health threat based on prolonged use of the water from at least some of these wells - assuming future exposure to

these contaminants at these concentrations is not reduced. Based on the potential quality control issues, a potential health threat for the remaining wells cannot be disregarded. Additional characterization of the groundwater quality and a thorough review of any changes in concentration over time are indicated.

There are important data gaps for evaluating water quality in private wells that have been assessed and un-assessed in the site area. Further evaluation of all potentially impacted private wells in the site area and of treatment systems in use is needed.

RECOMMENDATIONS

ATSDR supports a "Do Not Use Until Further Notice" action regarding the private wells sampled to date at this site until the site can be characterized further. Distribution of alternative residential water supplies should be considered until potential exposures are further understood and mitigated as needed.

ATSDR and NCEH recommend that further sampling be conducted by EPA to ensure the highest quality sampling methodology possible, including appropriate quality assurance samples. Next steps, if implemented, should be focused on areas of primary concern delineated by EPA or the appropriate agency. Further sampling plans should consider a full set of appropriate inorganic, organic, and bacteriological (total and fecal) constituents.

A full public health evaluation should be conducted on the data from the site area. Because many of these compounds (e.g., metals) affect the same organ systems, ATSDR recommends evaluating the mixture for public health impacts using computational techniques or other suitable methods to evaluate the potential for synergistic actions. The cumulative concentration of all dissolved combustible gases should be considered to protect against the buildup of explosive atmospheres in all wells in the area.

PUBLIC HEALTH ACTION PLAN

ATSDR Division of Regional Operations in consultation with ATSDR/NCEH Headquarters has begun drafting a full health consultation on the available data set for the Dimock site, including Cabot, PADEP, and residents' consultant-collected samples over the past 2 years. ATSDR will review any follow up environmental monitoring being considered by EPA to assess current community exposures at the site and will continue to coordinate data reviews with Federal and Commonwealth public health and environmental authorities.

Signature:

Signature: _____ Date: 12/29/11
Charles Edge, Health Scientist, ATSDR ERS

Signature: _____ Date: 12-29-11
Robert Helverson, Regional Representative, ATSDR R3

Concurrence:_____ Date: 12/30/11

Lora Werner, Senior Regional Representative, ATSDR R3

References

Swistock, B. R., S. Clemens and W. E. Sharpe. (2009). Drinking Water Quality in Rural Pennsylvania and the Effect of Management Practices. Final report to The Center for Rural Pennsylvania, Harrisburg, PA for Cooperative Agreements 2006-7 and 2007-10. p. 24. (http://www.rural.palegislature.us/documents/reports/drinking_water_quality.pdf).

U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement Appalachian Regional Coordinating Center, Pittsburgh, PA. 2001. Investigation and Mitigation of Fugitive Methane Hazards in Areas of Coal Mining. http://www.osmre.gov/resources/newsroom/News/Archive/2001/090601.pdf

Attachment 1.