UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SFUND RECORDS CTR
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SUBJECT: Request for CDC Assistance Regarding Potential Health Effects of Perchlorate Contamination at the San Gabriel Valley Superfund Sites

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AR0128

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BACKGROUND

As you know, the San Gabriel Valley, located approximately 40 miles east of downtown Los Angeles, is part of the Los Angeles metropolitan area. Over 90% of the water used by the approximately 1,000,000 residents of the 170 square mile valley is obtained from the ground water basin underlying the valley.

During 1979 and 1980, sampling conducted by the State of California detected widespread contamination of the valley's ground water resources by the chlorinated solvents, trichloroethylene (TCE), tetrachloroethylene (or perchloroethylene, PCE), and carbon tetrachloride (CTC). Since that time, approximately 60 out of 256 public water supply wells have shown contamination above the California Department of Health Services (DOHS) action levels for these compounds (5, 4, and 5 ppb, respectively for TCE, PCE, and CTC). These levels were based on EPA's health advisories regarding the carcinogenic risk of ingesting these compounds in drinking water. The 46 water purveyors in the valley are operating under an interim plan established by DOHS under which wells that are contaminated at levels greater than the action levels are taken out of service unless other methods (such as blending with water from uncontaminated wells) can reduce the contamination levels in water supplied to consumers to below the action levels.

Due to the widespread ground water contamination, EPA proposed in September 1983 that four large areas of ground water contamination be placed on the Superfund National Priorities List (NPL) as San Gabriel Areas 1-4. They were listed on the final NPL in May 1984. Although listed as four separate NPL sites (Area 1 - El Monte/Monrovia; Area 2 - Azusa/Baldwin Park; Area 3 - La Puente/City of Industry; and Area 4 - Alhambra), EPA is managing its Superfund response actions as if they are a single site. The sources of contamination have not been identified yet.

EPA'S SUPPLEMENTAL SAMPLING PROGRAM

During February-May 1985, EPA's contractor, CH_2M Hill, sampled 70 existing wells in the San Gabriel Valley as part of an initial site investigation, which is referred to as the Supplemental Sampling Program (SSP). This sampling was coordinated with the sampling of an additional 119 wells conducted by the local municipal water districts to comply with a State-mandated sampling program. All of these wells were sampled for the full list of EPA organic priority pollutants. The purpose of this program was to comprehensively evaluate the extent of ground water contamination in the valley based on data from existing wells prior to the initiation of an expensive monitoring well drilling program. As part of the SSP, CH_2M Hill was directed to compile all existing data concerning the contamination, develop a ground water flow model, and identify the remaining data gaps that must be addressed prior to developing remedial action alternatives.

Prior to the initiation of the SSP, EPA had identified an industrial facility in the City of Azusa as a potential source of ground water contamination in San Gabriel Area 2. At one time, this facility was used to develop, test and produce rocket and jet engines. Historical records indicated that chlorinated solvent wastes may have been been transported along with solid rocket fuel wastes to a nearby gravel pit for disposal by burning. Since the gravel pit is located in an area of highly permeable soils, there is a strong possibility that waste may have leached into the ground water if there was any significant delay between when the wastes were trucked to the gravel pit and when they were burned. In addition, several leach pits were used on-site for disposal of small quantities of waste. In an attempt to identify waste disposal by this facility as a source of ground water contamination, EPA, as part of the SSP, had water samples from 14 wells surrounding this facility sampled for several compounds that are associated with rocket engine testing, such as perchlorate ion, aniline, and xylidene. Perchlorate ion (ClO_4^-) was included because this facility used both ammonium perchlorate and potassium perchlorate as oxidizers in its rocket fuels. Of the special compounds tested for, only perchlorate ion was detected in the water samples.

RESULTS OF PERCHLORATE TESTING

The 14 samples were collected on 6 different days. For each daily batch of samples, one duplicate sample was collected and one field blank was included in the batch. The field blanks were prepared in CH_2M Hill's laboratory and then placed in the shipping containers used for the environmental samples. The duplicates and blanks were not identified to laboratory personnel performing the analyses.

The perchlorate analyses were performed by CAL Analytical Laboratory in Sacramento, California using a proprietary colorimetric analytical method. The results of the perchlorate analyses are summarized in an attached table. The limits of detection claimed by the laboratory were 0.02 mg/l or 0.05 mg/l, depending on which batch of samples is considered. The laboratory reported contamination in all of the environmental samples, ranging from 0.11 mg/l to 2.6 mg/l. However, a major quality assurance problem was identified in that contamination was detected in 5 of the 6 field blanks. The source of this contamination has not been identified. For one batch of samples, the contamination level in the blank was roughly equivalent to the highest contaminant level in the environmental samples. For this reason, EPA quality assurance data reviewers rejected all of the results from this batch as invalid. In three other batches, several environmental samples were contaminated at levels either below or slightly higher than that of the field blank; the EPA data reviewer reported the results of these samples as probably 'undetected contamination' with the level of detection identified as the level of contamination reported by the lab.

Despite the quality assurance problems described above, it appears clear that perchlorate contamination does exist in the ground water. In one batch, the field blank was uncontaminated, but all three environmental samples were contaminated at levels ranging from 0.38 mg/l to 0.81 mg/l. In several of the other batches, the perchlorate concentration in 5 wells were reported at levels much higher than the low level contamination found in the field blanks. These concentrations ranged from 1.0 mg/l to 2.6 mg/l. Therefore, based on this sampling episode, it is clear that some perchlorate contamination exists, however, the actual contaminant concentrations reported for several wells may be in question. In any event, EPA will be planning further sampling of these wells in the near future. In addition, since only a limited number of wells in the area were originally sampled, EPA will also plan to sample a larger number of wells that may be potentially contaminated with perchlorate ion.

SIGNIFICANCE OF THE PERCHLORATE RESULTS

The final report of the Supplemental Sampling Program is currently scheduled to be released to the public in late January. This will be the first notification to the public concerning the perchlorate contamination. An obvious question to be raised is whether there are any potential health effects associated with drinking ground water contaminated with perchlorate ion. A table is attached which lists the number of service connections (assumed approximately equal to the number of households served) associated with the water purveyors whose wells are affected. A minimum of 32,000 households are potentially affected (42,000 if it is assumed that contamination may exist in the Valley County Water District wells, despite the quality assurance problem and

equivocal sampling results). Also, since only a limited number of wells were sampled, it cannot be ruled out that the contamination is more widespread than can be currently confirmed. Therefore, it is critical that EPA be able to provide information to the affected community as to whether this contamination poses a potential public health threat.

My staff conducted a review of regional sources of health effects data, which included consulting the Water Supply Branch of the Water Management Division. The Water Supply Branch did not provide any information regarding the health effects of perchlorate, but noted that the National Academy of Sciences had discussed the health effects of chlorite and chlorate ions in drinking water in a recent volume of the Drinking Water and Health series. Of the oxygenated chlorine compounds, the order of decreasing oxidizing properties is: hypochlorite > chlorite > perchlorate > chlorate. The American Chemical Society published a monograph titled Perchlorates, Their Properties, Manufacture and Uses* in 1960. This monograph included a chapter on the biological action of perchlorates that reviewed data available at that time regarding the toxicity of perchlorates. This monograph concluded that perchlorate ion did not have the toxic properties associated with chlorate ion. However, this monograph did not discuss the potential health effects associated with long-term ingestion of small amounts of perchlorates. Except for this monograph and brief references in manuals such as Sax's Hazardous Properties of Industrial Materials, my staff has been unable to locate any additional information regarding the potential health effects of perchlorates.

REQUEST FOR CDC ASSISTANCE

To enable EPA to respond to this situation in the San Gabriel Valley, EPA requests CDC assistance in determining the potential health effects associated with perchlorate ion contamination of ground water. Specifically, EPA requests that CDC respond to the following questions:

1) In general, what potential health effects may be associated with using ground water contaminated with perchlorate ion?

2) More specifically, at what concentration of perchlorate ion in ground water would it be expected that no adverse acute health effects would be observed [i.e., at what level of contamination should EPA or other parties consider taking immediate action to provide an alternative source of uncontaminated water?] if the period of exposure of the population was of the order of magnitude of several months?

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* Perchlorates, Their Properties, Manufacture, and Uses, American Chemical Society Monograph Series, Joseph C. Schumacher, ed., Reinhold Publishing Corporation, New York, 1960.

3) Again more specifically, at what concentration of perchlorate ion in ground water would it be expected that no adverse chronic health effects would be observed if the period of exposure of the population was of the order of magnitude of years (e.g., five years) [i.e., at what level of contamination should EPA or other parties consider taking long-term actions to provide a source of uncontaminated water?]? If it cannot be determined whether there is a threshold for the potential chronic health effects, please provide information concerning the magnitude of risk of chronic health effects.

4) Does the specific perchlorate salt cation (e.g., potassium, sodium or ammonium) associated with perchlorate ion in ground water have any significance regarding the potential health effects that may be observed? Is it necessary for EPA's follow-up sampling for confirmation of the levels of perchlorate ion to also include sampling for cations to determine the potential health effects?

5) If sufficient scientific information to answer questions 1-4 is not available at this time, what toxicological testing would be required to be able to answer these questions?

As stated above, this contamination has been found in several operating public water supply wells. Due to the nature of the public health threat if perchlorate ion is associated with adverse health effects, EPA requests that CDC provide an immediate response to question 2 (acute health effects of perchlorate ion) within one week if possible.

Regarding complete answers to all of the questions, since EPA will be releasing information to the public regarding the contamination in late January, EPA requests that CDC provide at least its preliminary findings by January 22, 1986, along with a timetable for submitting further findings to EPA if the results are not final at that time. In addition, since EPA will be planning further sampling prior to that date, EPA requests that CDC please provide an answer to the fourth question as soon as possible.

If you have any questions concerning this request, please contact Neil Ziemba of my staff at FTS 454-7520.

Attachments

RESULTS OF PERCHLORATE ANALYSES

WELL OWNER	WELL NUMBER	PERCHLORATE CONCENTRATION (mg/l)	RESULTS OF EPA QUALITY ASSURANCE DATA REVIEW
BATCH 1:			
Valley County Water District	1900027	0.18	INVALID DATA[1]
Valley County Water District	1900029	0.85	INVALID DATA[1]
Duplicate of Well # 1900027	1900027	0.17	INVALID DATA[1]
Field Blank	-	0.82	-
BATCH 2:			
City of Azusa # 5	1902537	0.68	VALID DATA
Azusa Valley Water Co., # 4	1902115	0.38	VALID DATA
Azusa Valley Water Co., # 7	1902425	0.81	VALID DATA
Duplicate of Well # 1902115	1902115	0.38	VALID DATA
Field Blank	-	0.05	-
BATCH 3:			
City of Glendora, # 3-G	1901525	1.8	PARTIALLY VALID DATA[2]
City of Glendora, # 7-G	1900831	1	PARTIALLY VALID DATA[2]
Azusa Valley Water Co., # 6	1902117	1.8	PARTIALLY VALID DATA[2]
Duplicate of Well # 1901525	1901525	2.2	PARTIALLY VALID DATA[2]
Field Blank	-	0.42	-

RESULTS OF PERCHLORATE ANALYSES
(continued)

WELL OWNER	WELL NUMBER	PERCHLORATE CONCENTRATION (mg/l)	RESULTS OF EPA QUALITY ASSURANCE DATA REVIEW
BATCH 4:			
Miller Brewing # 1	8000076	U (0.15)	PARTIALLY VALID DATA[3]
City of Azusa # 4	1902536	2.1	VALID DATA[4]
Transit Mix # 2	1900038	U (0.45)	PARTIALLY VALID DATA[3]
County of Los Angeles # 1SF	8000070	U (0.26)	PARTIALLY VALID DATA[3]
Duplicate of 8000076	8000076	U (0.11)	PARTIALLY VALID DATA[3]
Field Blank	-	< 0.21	-
BATCH 5:			
Covina Irrigating Co., Contract	1900881	2.6	VALID DATA[4]
Duplicate of 190881	1900881	2.2	VALID DATA[4]
Field Blank	-	< 0.22	-
BATCH 6:			
Valley County Water District	8000060	U (0.49)	PARTIALLY VALID DATA[3]
Duplicate of 8000060	8000060	U (0.49)	PARTIALLY VALID DATA[3]
Field Blank	-	Rejected[5]	-

Notes to Results of Perchlorate Analyses:

[1] The data were determined to be invalid due to the detection of contamination in the field blank at a level approximately equal to the highest contamination level reported in an environmental sample.

[2] The data were determined to be only partially valid (valid for limited purposes) due to the detection of contamination in the field blank at a level 1/2 to 1/5 as high as reported in the environmental samples.

[3] The results are reported as undetected contamination since the level of contamination in the environmental sample as reported by the laboratory is less than 5 times the reported level of contamination in the field blank. The concentration in parentheses is the actual concentration reported by the laboratory. It is considered to be the level of detection for this particular sample analysis result.

[4] Although contamination of the field blank was reported, the data for this sample is considered valid since the level of contamination reported in the environmental sample is greater than 5 times the reported level of contamination in the field blank.

[5] Contamination of the field blank was reported by the laboratory.

APPROXIMATE NUMBER OF SERVICE CONNECTIONS
FOR PUBLIC WATER PURVEYORS WITH WELLS
CONTAMINATED BY PERCHLORATE ION

Water Purveyor	Number of Contaminated Wells	Service Connections
City of Azusa	2	5,700
Azusa Valley Water Company	3	14,230
City of Glendora	2	12,500
Valley County Water District	0*	9,900

* Three of Valley County Water District's wells were sampled for the presence of perchlorate ion. The laboratory originally reported contamination in all three of the sampled wells. EPA's subsequent quality assurance data review questioned the validity of the sample results due to the presence of contamination in the field blank. Although the finalized EPA sampling results do not include confirmation of the contamination levels in these three wells, the possibility that the wells are contaminated with perchlorate ion cannot be ruled out without further sampling.