

FORMER U.S. DEPARTMENT OF AGRICULTURE GRAIN BIN PROJECT

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ABSTRACT

The U.S. Environmental Protection Agency (EPA), Region 7, in cooperation with the U.S. Department of Agriculture (USDA) and state agencies, continues to conduct groundwater, well water, and soil and soil gas sampling at known locations of former USDA/Commodity Credit Corporation (CCC) grain storage facilities in Region 7. The purpose of this sampling is to look for carbon tetrachloride and related chemicals that may be contaminating the groundwater. The source of the potential contamination is from a grain fumigant formerly used by the CCC and others in the 1950s, 1960s, and 1970s called "80/20," that contained 80% carbon tetrachloride. This grain fumigant may have migrated into the groundwater and could be contaminating public and private wells nearby. Carbon tetrachloride is a probable human carcinogen. Its use as a grain fumigant was banned by the EPA in 1985.

Over the last several years, similar sampling efforts have been conducted at 829 former USDA/CCC storage facilities in Iowa, Kansas, Missouri, and Nebraska. Those sampling efforts have resulted in the discovery of carbon tetrachloride contaminated groundwater at 130 locations. At 61 of those locations, the contamination level exceeded the EPA's established drinking water standard for carbon tetrachloride, of five micrograms per liter or five parts per billion. Levels exceeding the drinking water standard could pose an increased health risk over a lifetime, if contaminated water continues to be used for drinking, cooking, and showering. Steps have been taken at each site where contamination has been discovered to provide alternative water for affected users. Efforts to remediate the contaminated groundwater at these locations have focused on the implementation of innovative technologies.

Key words: carbon tetrachloride, fumigant, contamination, carcinogen

INTRODUCTION

The U. S. Environmental Protection Agency, Region 7, has been actively working with state agencies within that region to conduct sampling activities at former U.S. Department of Agriculture/Commodity Credit Corporation (USDA/CCC) grain storage facilities located in Iowa, Kansas, Missouri, and Nebraska. The intent of this project was to protect public health and drinking water supplies by addressing possible contamination of groundwater by carbon tetrachloride, a component of a grain fumigant used at these grain storage facilities. Sampling activities have been completed at those facilities identified, with the assistance of USDA/CCC. These activities have revealed numerous detections of carbon tetrachloride above and below the federal drinking water standard of five micrograms per liter.

DISCUSSION

The Commodity Credit Corporation (CCC) initiated a large-scale grain bin construction program in the late 1940's for the purpose of storing surplus grain. These temporary facilities were used intermittently

in areas where commercial storage was unavailable. At its peak during the 1950's, CCC operated grain storage facilities on leased property at several thousand locations nationwide. Some of the grain was stored for a period of several years before being sold. During the storage period, it was sometimes necessary to fumigate the grain to control destructive insects. The most commonly used fumigant during this period was an 80/20 mixture of carbon tetrachloride (CCl_4) and carbon disulfide (CS_2), respectively. Ethylene dibromide was also present in these fumigants but in smaller amounts. The liquid product was applied directly onto the grain from the top of the storage bin. Fumigation using CCl_4 combinations was accepted grain storage practice for insect control by the industry at the time and was not replaced with newer contact insecticides until the early 1960's. CCC substituted the insecticide Malathion for CCl_4 in the early 1960's. Also in the early 1960's, CCC began selling off many of its storage structure to farmers who used them for farm storage. CCC terminated its grain storage program by the early 1970's and sold all existing grain storage bins and equipment. CCC records relating to storage and fumigation of grain stored in the bins, and their disposal, were not retained following termination of the program in the early 1970's.

Groundwater contamination by carbon tetrachloride was first discovered in Region 7 at Waverly, Nebraska, in 1982 during a routine test of the public water supply (PWS) by the Environmental Protection Agency (EPA). Initial contaminant levels indicated 200 parts per billion (ppb). Subsequent sampling in 1986 revealed concentrations up to 3128 ppb. In 1986, EPA established a recommended maximum contaminant level (RMCL) in groundwater for CCl_4 , and in 1986 they established the maximum contaminant level (MCL) for CCl_4 at five ppb. By 1986, concerns were raised about past fumigation practices by the CCC at Waverly, and other CCC grain storage locations in Region 7. At Waverly, EPA began conducting tests to locate the source of contamination. It was determined that the former CCC grain storage site was this source.

Numerous sampling activities have been conducted in Iowa, Kansas, Nebraska, and Missouri since the initial detection of carbon tetrachloride at Waverly.

RESULTS

Iowa

The EPA has sampled 175 former USDA/CCC grain storage facilities. Only three locations had detections of carbon tetrachloride. None were over the drinking water standard.

Kansas

The Kansas Department of Health and Environment and the EPA have sampled at 273 former USDA/CCC grain storage facilities. These efforts revealed 38 locations (14%) with detections of carbon tetrachloride, with 22 (8%) of these locations having levels exceeding the established drinking water standard of five micrograms per liter.

Missouri

The Missouri Department of Natural Resources and the EPA have sampled 77 former USDA/CCC grain storage facilities. Nine locations (12%) had detections of carbon tetrachloride, with four (5%) of these locations exceeding the drinking water standard of five micrograms per liter.

Nebraska

The Nebraska Department of Environmental Quality, Nebraska Department of Health and Human Services, and the EPA have sampled 308 former USDA/CCC grain storage facilities. These efforts revealed 80 locations (26%) had detections of carbon tetrachloride, with 35 (11%) of these locations exceeding the drinking water standard of five micrograms per liter.

As a result of these sampling efforts, two locations (Bruno, Nebraska, and Waverly, Nebraska) were placed on EPA's National Priorities List (NPL) for cleanup of carbon tetrachloride contamination. EPA entered into an Administrative Order on Consent with the USDA for the groundwater contamination at Murdock, Nebraska. All locations with detections exceeding the drinking water standard were provided alternative sources of drinking water (i.e., bottled water, connection to public water supply).

CONCLUSION

Carbon tetrachloride has not been used as a grain fumigant for nearly 16 years, yet it has recently been detected in soils and groundwater at many locations in Region 7. This project has conducted sampling activities at 829 locations in the four states that make up this region. A total of 130 locations (16%) had detections of carbon tetrachloride in water samples, with 61 (47%) of these with levels exceeding the drinking water standard of five micrograms per liter. Based on data that have been collected, it is evident that past fumigation practices at former USDA/CCC grain storage facilities has negatively impacted some groundwater sources in Region 7.