



ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

Public Health Assessment for

RAILROAD AVENUE GROUNDWATER CONTAMINATION
WEST DES MOINES, POLK COUNTY, IOWA
EPA FACILITY ID: IA0001610963
MARCH 5, 2004

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE**

Agency for Toxic Substances and Disease Registry

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment 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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PUBLIC HEALTH ASSESSMENT

RAILROAD AVENUE GROUNDWATER CONTAMINATION

WEST DES MOINES, POLK COUNTY, IOWA

EPA FACILITY ID: IA0001610963

Prepared by:

Iowa Department of Public Health
Hazardous Waste Site Health Assessment Program
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. (The legal definition of a health assessment is included on the inside front cover.) If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations—the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Interactive Process: The health assessment is an interactive process. ATSDR solicits and evaluates information from numerous city, state and federal agencies, the companies responsible for cleaning up the site, and the community. It then shares its conclusions with them. Agencies are asked to respond to an early version of the report to make sure that the data they have provided is accurate and current. When informed of ATSDR's conclusions and recommendations, sometimes the agencies will begin to act on them before the final release of the report.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E60), Atlanta, GA 30333.

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SUMMARY

The Railroad Avenue groundwater contamination site (the site) is in West Des Moines, Polk County, Iowa. Located on approximately 120 acres, the site comprises mixed residential, industrial and commercial properties. Underneath the site, chlorinated volatile organic compounds (VOCs) have contaminated the shallow (i.e., 30–50 feet deep) groundwater. These compounds have compromised several shallow wells within the West Des Moines water works system. A contamination source, however, has not yet been identified.

In 1993, routine water analysis by the city of West Des Moines identified 1, 2 cis-dichloroethylene (1, 2 cis-DCE) at a concentration of 1.2 µg/L (micrograms per liter of water) in the water supply. Subsequently, several shallow municipal wells were found to be contaminated by VOCs, including 1, 2 cis-DCE, trichloroethylene (TCE), tetrachloroethylene (PCE) and benzene. Five of these wells have been taken out of service. Because of the impact on the West Des Moines water supply, the U.S. Environmental Protection Agency (USEPA) has assigned the site to the National Priorities List.

Surface water and sediment at the site have not been impacted by the VOCs. Testing for VOCs in surface soils has not revealed any significant VOC contamination. Subsurface soils—generally 8 feet or greater in depth—are contaminated with VOCs, but at levels which should not present a health hazard.

The past, present, and future health hazard category chosen for this site is **no apparent public health hazard**. This category is used when exposure to toxins might be occurring or might have occurred in the past, but at levels below any known health hazard. Analysis of available environmental data has not revealed that residential or commercial water customers are or have been exposed to VOCs at concentrations that might cause any adverse health effects.

BACKGROUND

Site Description

The Railroad Avenue site comprises residential, commercial and light industrial properties. Much of the land contained within the site was once used for railroad car repair and servicing. The site is about 120 acres in size and is approximately bounded on the south by the lakes at the Raccoon River Park, on the west by 19th Street, on the north by Holiday Park, and on the east by 5th Street in West Des Moines. Site access is not restricted. Residences are located primarily on the northern and western boundaries of the site (1, 2).

In 1993, a routine water distribution sample collected by the West Des Moines water works was found to contain the volatile organic compound (VOC) 1, 2 cis-dichloroethylene (1, 2 cis-DCE) at a concentration of 1.2 µg/L (micrograms per liter of water). Prior to 1993, no evidence of VOC contamination had been found in West Des Moines water. VOC contamination in the municipal water supply was traced back to two shallow wells installed in 1991, within the confines of the Railroad Avenue site. After the discovery of the VOCs, these wells were immediately taken out of service. Nevertheless, under the combined effects of natural groundwater flow and pumping from uncontaminated wells, underground contaminants have moved toward the south and east. From 1994–1999, several other municipal wells within the site were found to contain DCE and other VOCs, including benzene, trichloroethylene (TCE) and tetrachloroethylene (PCE). Three more wells were taken out of service as soon as the contamination was discovered. In 1997 USEPA contractors conducted a Preliminary Assessment/Site Investigation (PASI) and in 1999 conducted an Expanded Site Investigation (ESI). But they could not identify a source of the VOCs (1, 2), despite the fact that the investigations involved extensive soil, water and sediment sampling and analysis. Based on these prior investigations and the impact of VOCs on the West Des Moines municipal wells, the USEPA has assigned the site to the National Priorities List (NPL).

About 3,700 persons live within 1 mile of the Railroad Avenue site. Still, the population at risk could potentially include all residential and commercial water users within the city limits of West Des Moines—the West Des Moines water system supplies water to a population of 46,980 (3). This population is served by 22 wells: 19 shallow municipal wells drilled approximately 30 to 50 feet deep in the alluvial aquifer, and three deep wells approximately 2,500 feet into the Jordan aquifer. Four of these shallow wells and one deep well are within the boundaries of the Railroad Avenue site. All other wells are from ½–2 miles to the south and southwest and slightly downgradient of the site. Additional water is purchased from the Des Moines water works, supplied by surface water intakes on the Raccoon and Des Moines Rivers. The amount purchased depends on the time of year, with more being purchased during the summer months.

West Des Moines relies on a blended system of water distribution whereby water from several municipal wells is combined into a finished product. The blended nature of the water supply ensures that no one well will supply a significant fraction of the total water used by the community. About half of West Des Moines water comes from the three deep wells, which have not been contaminated by VOCs. Water supplied to West Des Moines residential and commercial customers is tested quarterly, and has not shown evidence of VOC contamination approaching levels of health concern (1, 2, 4) (see Tables 1 and 2).

There are no known private wells in use within the Railroad Avenue site, or within the West Des Moines water works service area.

Contaminants of Concern

VOCs are the contaminants of concern at this site because they are present in the largest quantities and have directly impacted the West Des Moines water supply system. VOC contamination has caused several municipal wells to become unusable—this is why the site has been assigned to the NPL.

Environmental Data

Surface Water and Sediment

Surface water and sediments associated with the Railroad Avenue site have not shown VOC contamination above any health-based screening or reference levels (1, 2). The Racoon and Des Moines rivers, both of which supply a part of West Des Moines' water needs, have high-volume flows and act as sinks to dilute any contaminants that might reach them.

Subsurface and Surface Soils

Shallow soils (0-2 feet) within the Railroad Avenue site do not contain levels of VOCs above any health screening or reference values. No true surface soil samples (0-2 inches) are available for review, however, because of the volatile nature of the chemicals of concern at this site, it is very unlikely that significant levels would be found in the top inches of soil. Subsurface soils (8-10 feet deep) on industrial properties within the site are contaminated with 1, 2 cis-DCE at up to 3,800 µg/kg (micrograms per kilogram of soil), TCE at 26.7 µg/kg, and benzene at 58 µg/kg (1, 2). The concentrations of VOCs found in subsurface soil are less than the ATSDR environmental media evaluation guides (EMEG) or cancer risk evaluation guides (CREG) for DCE, TCE and benzene in soil. The EMEG and CREG are screening or comparison values, used to assess the relative health hazard posed by contaminants at a particular site. No level of VOCs exceeding any reference or screening values has been found in residential soils at the Railroad Avenue site.

Groundwater

Table 1 lists the concentrations of 1, 2 cis-DCE and benzene in West Des Moines (WSDM) wells #12 and #13 for the period 1991-1999. Wells #12 and #13 are where VOC contamination was discovered originally in 1993. The maximum contaminant levels (MCLs) for drinking water sources are health-based standards established by the USEPA and are considered to be protective of public health for a lifetime of exposure. The MCL for 1, 2 cis-DCE is 70 µg/L, and for benzene the MCL is 5 µg/L. In 1994, well #12 contained benzene at a concentration of 11 µg/L, which exceeded the MCL. In 1996, well #13 exceeded the benzene MCL and the MCL for 1, 2 cis-DCE. To date, no other VOCs have been found in wells #12 and #13. Generally, DCE and benzene concentrations in these two wells have been decreasing since 1994 (1, 2).

Table 1. Historical analytical results for groundwater wells #12 and #13 at the Railroad Avenue site

Sampling Date	Location-well number	1,2 cis-DCE (µg/L)	Benzene (µg/L)
09/16/91	WSDM #12	ND	ND
	WSDM #13	ND	ND
06/15/93	Distribution	1.2	ND
07/01/94	WSDM #12	0.9	11
	WSDM #13	28	ND
05/09/95	WSDM #12	0.6	1.6
	WSDM #13	56	1.4
05/07/96	WSDM #12	ND	ND
	WSDM #13	83	10
10/10/96	WSDM #12	5.2	1.1
	WSDM #13	46	2.9
10/1997	WSDM #12	17	ND
	WSDM #13	ND	ND
09/16/99	WSDM #12	4.5	0.29
	WSDM #13	6.5	ND

ND = compound not detected above method detection limits.

In 1997, 1, 2 cis-DCE was found in West Des Moines wells #6 and #7 at 4 µg/L and 38 µg/L, respectively. The 1999 ESI report found low concentrations of 1, 2 cis-DCE in municipal wells #5 and #21. These wells contained 1, 2 cis-DCE at 2.3 µg/L and 0.22 µg/L (see Table 2). Benzene has not been found in any of the wells listed in Table 2.

Table 2. Sampling results for West Des Moines Wells 5, 6, 7, 19, 21 and post-treatment distribution supply 1997-99.

Sampling Date	Location—well number	1,2-cis DCE (µg/L)	Benzene (µg/L)	TCE (µg/L)	PCE (µg/L)
10/97	WSDM #6	4	ND	ND	ND
10/97	WSDM #7	38	ND	ND	ND
09/15/99	WSDM #6	16	ND	0.87	ND
09/15/99	WSDM #7	ND	ND	ND	ND
09/15/99	WSDM #5	2.3	ND	0.57	0.14
09/15/99	WSDM #19	ND	ND	0.41	ND
09/15/99	WSDM #21	0.22	ND	6.8	0.37
09/15/99	Distribution	0.25	ND	0.16	ND

ND = compound not detected above method detection limits.

The MCL for both TCE and PCE is 5 µg/L. In only one instance from 1997 to 1999 was the MCL exceeded, and that was well #21 at 6.8 µg/L TCE in September 1999. Wells #6, #7, #12, #13, and #21 have been taken out of service because of the presence of VOCs. Wells #5 and #19 remain in service, but like all other wells, they are monitored regularly for evidence of further contamination. The post-treatment distribution water sample collected in 1999 contained TCE and 1, 2 cis-DCE, but at levels considerably below the MCLs. According to the West Des Moines water works, no VOCs were detected in the post-treatment supply during the year 2000 (4).

Community Health Concerns

There are no known community health concerns regarding the West Des Moines Railroad Avenue site. In the summer of 2000, West Des Moines water works mailed to its customers an informational flyer about the site. The flyer described the water contamination problem and assured the public that any wells posing a health risk would be taken out of service as quickly as possible. A public availability session regarding the site was held on October 24, 2000. Those in attendance included representatives from USEPA, IDPH, Iowa Department of Natural Resources (IDNR) and West Des Moines municipal government. No private citizens attended this availability session. In October 2001, the USEPA distributed a fact sheet requesting public

comment about the site (5). IDPH staff made site visits in the winter of 2001 and spring of 2002. No unusual site conditions were observed during either of these visits.

Quality Assurance and Quality Control

In preparing this health assessment, IDPH relied on the information provided in the referenced documents. IDPH assumes that adequate quality assurance and quality control measures were followed regarding chain of custody, laboratory procedures and data reporting. Furthermore, during the preparation of this public health assessment, IDPH concluded the data were adequate and reliable.

DISCUSSION

A public health assessment determines whether people have been exposed, or could possibly become exposed to site contaminants. Identification of exposure pathways, either completed or potential, is a necessary part of the public health assessment process. A completed exposure pathway consists of the following five elements: 1) a source of contamination, 2) transportation of the contaminants through an environmental medium (air, water or soil), 3) a point of exposure, 4) a route of human exposure, and 5) an exposed population. For an exposure pathway to be complete, all these elements must be present. Completed exposure pathways indicate that exposure has occurred in the past, might be occurring now, or could possibly occur in the future.

In a potential exposure pathway, at least one of the five elements is missing. Also, an exposure pathway can be eliminated from further analysis if one or more elements do not exist, or might never exist.

Completed Exposure Pathways

No completed exposure pathways, to significant levels of contaminants, have been identified at the site. Based on available site data, any past exposures to Railroad Avenue site contaminants would have been at levels well below those known or suspected of causing human health problems. VOCs were first discovered in the water supply in 1993; there is no existing evidence of VOC contamination or exposure prior to that time.

Currently, people living in and around the site are not exposed to on-site contaminants. West Des Moines water customers are not being exposed as no VOC contamination now exists in the treated water supply. Future exposures are unlikely to occur because any contaminated wells have been removed from service, and the West Des Moines water supply is monitored regularly for the presence of VOCs and other contaminants. Discontinuing use of contaminated wells and a program of regular well monitoring will help to ensure that public health is protected, and that

VOCs do not enter the treated water delivered to West Des Moines residents.

Potential Exposure Pathways Analysis

Ingestion of contaminated water and soil, and inhalation of vapors from that water or soil, constitute potential exposure pathways. The following is an analysis of the likelihood of human exposure through potential ingestion or inhalation pathways.

Groundwater: Volatile organic compounds have contaminated the groundwater at the Railroad Avenue site. Concentrations of these compounds are generally well below any health-based water quality standards, and supply wells are monitored quarterly. For these reasons, current and future exposures to VOCs at levels of concern are not likely. Additionally, past exposures to VOCs were probably not at levels of concern because the limited duration of those exposures and the blending of water from multiple sources.

Soil: Because of the depth of contamination, soil is not a viable exposure pathway. The largest contamination concentrations are on industrial properties within the site, at depths of 8 feet or more. These soils contain VOCs, but at concentrations below health-based screening values. The soils and dust have not been, and are not expected to be, sources of environmental exposure for those who live and work in and around the site. For these reasons, it is also unlikely that soils will present a health hazard in future.

Surface water: Surface water has not been impacted by the Railroad Avenue contamination. The Racoon and Des Moines rivers have high volume flows, thus they act as sinks to dilute any contaminants that might reach them. Also, analysis of surface waters has not revealed the presence of VOCs at levels approaching any health concerns.

Air: Because contaminants are not found at the surface but underground, air is not a likely pathway of exposure. Dusts and vapors arising from soils are not likely to pose a health hazard. Migration of vapors from groundwater into homes and businesses is also unlikely because of the relatively low concentrations of VOCs present and the depth to the contaminated water (30-50 feet). Likewise, inhalation of VOCs while showering or bathing should not be a viable exposure pathway, as no significant VOC contamination has been found in the treated water supply.

Toxicity Evaluation

Ingesting water containing VOCs such as DCE, TCE, PCE and benzene for long periods could lead to adverse health effects, although the extent of some of these effects is not yet clear (6-9). Health studies of populations exposed to low levels of VOCs in drinking water have shown conflicting

results as to any long-term adverse health effects. One study suggested an association between long-term exposure to VOC-contaminated well water (containing up to 100 µg/L VOCs) and increased urinary tract infections in children—although these children were also exposed to a number of other chemicals. In another study involving well water contamination, three communities in Michigan exposed to TCE and PCE in drinking water at levels above MCLs experienced no increase in kidney disease (6, 7).

The link between ingestion of VOC-contaminated water and cancer is controversial. A study of 1.5 million residents in 75 New Jersey towns found elevated rates of total leukemias, childhood leukemias, acute lymphatic leukemia, and non-Hodgkin's lymphoma in females after long-term exposure to greater than 5 µg/L TCE (6). By contrast, a study of total cancer incidence, liver cancer, non-Hodgkin's lymphoma, Hodgkin's disease, and leukemia in two Finnish villages with drinking water containing 200 µg/L TCE and 180 µg/L PCE found no significantly increased rates of these diseases (6, 7). A study in New Jersey found PCE in drinking water was associated with an increased incidence of non-Hodgkin's lymphoma in females. That said, however, the investigators noted that the conclusions of their study were limited by lack of information on individual long-term residence and water consumption (7).

Benzene is a known human carcinogen, but much of the evidence for this conclusion is from inhalation exposure studies—not studies of drinking contaminated water (9). No studies have reported a link between an increased risk of cancer and—primarily—ingestion, or oral exposure to benzene. Any other long-term (chronic) health effects from ingesting water containing benzene are not well established. The ATSDR Toxicological Profile for Benzene could not find any human health studies relating respiratory, cardiovascular, liver, or kidney effects and oral exposure to benzene. Likewise, no studies could be found on any reproductive or developmental health hazards following ingestion of benzene-contaminated water (9).

It is unlikely that any chronic health symptoms, including an increased risk of cancer, would occur following exposure to the very low concentrations of VOCs found at the Railroad Avenue site. This conclusion applies equally to sensitive populations such as children and the elderly.

CHILDREN'S HEALTH

Exposure to toxic substances poses a greater risk to children than to adults. Children breathe more air and consume more food and water per unit of body weight than do adults. They are also less likely to recognize and avoid hazardous situations and conditions.

The health effects of possible toxic exposure to children living within or visiting the Railroad Avenue site have been considered in relation to the degree of health threat the site poses. Because no VOC contamination now exists in the West Des Moines water distribution system, it is unlikely that children would experience any adverse health effects from ingesting West Des Moines water. As has been stated, due to their depth, contaminated soils at the site are not readily

accessible. And surface waters and sediment are not contaminated at levels which would be a health concern, even to children.

CONCLUSION

Several West Des Moines water wells have been taken out of service because of contamination, and testing of the treated (finished) water supply has shown only trace amounts of VOCs, below any level of health concern. Based on the available information, no adverse health effects are expected in residents or commercial water customers who consume water from the city of West Des Moines. As a result, IDPH and ATSDR have determined that the Railroad Avenue site currently presents **no apparent public health hazard**.

The health hazard category for any past exposures at the site is **no apparent public health hazard**. Exposure to VOCs in the West Des Moines water supply might have occurred before any contaminated wells were taken out of service, but at levels far below any that have been shown—or suggested to have caused—adverse health impacts.

RECOMMENDATION

IDPH recommends continued quarterly monitoring of municipal wells and the water distribution system in West Des Moines.

PUBLIC HEALTH ACTION PLAN

Actions Undertaken

- In October 2000, IDPH staff attended a public availability meeting for the Railroad Avenue site.
- IDPH staff have completed a public health needs assessment for this site.
- This Public Health Assessment went out for public comment for 30 days starting on July 22, 2004. A draft copy of this assessment was made available for public comment at the West Des Moines Public Library. No comments from the public were received during the 30-day comment period.

Actions Planned

- IDPH will update the public health assessment if new data become available.
- IDPH will work with EPA, IDNR and the West Des Moines water works to develop health education and community involvement materials to inform residents regarding the water quality.

REFERENCES

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CERTIFICATION

The public health assessment for the Railroad Avenue site was prepared by the Iowa Department of Public Health, Hazardous Waste Site Health Assessment Program, 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 assessment began.



Technical Project Officer, Cooperative Agreement Team, SSAB, DHAC, ATSDR

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



Lead, CAT, SSAB, DHAC, ATSDR