




Public Health Assessments & Health Consultations

PRELIMINARY PUBLIC HEALTH ASSESSMENT

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WILLIAMS PIPE LINE COMPANY
SIOUX FALLS, MINNEHAHA COUNTY, SOUTH DAKOTA

SUMMARY

The Williams Pipe Line Disposal Pit (WPL) site is located on the northeast corner of the Williams Pipe Line Terminal facility in Minnehaha County, Sioux Falls, South Dakota. Fertilizers, petroleum products, and pesticides were dumped and periodically burned at the disposal or burn pit. The disposal pit and the contaminants from it have been identified as a National Priorities List (NPL) site by the U.S. Environmental Protection Agency (EPA) . The Williams Pipe Line Terminal facility in Sioux Falls has a long history of spills of petroleum products which have led to extensive contamination of area ground water. This contamination was the source of exposure to hexane, benzene and pentane in the old Hayward School and a residence which posed fire, explosion, and health hazards. The school and residence have been leveled and the groundwater in the area is being treated. A new Hayward School was built to the northwest of WPL.

Because spills of petroleum products alone are not covered under the Superfund laws, the contamination due to those spills is not considered part of the NPL site. However, this public health assessment evaluates the possible health impact of the entire Williams Pipe Line Terminal facility.

Private drinking water wells on the northeast (1 well) and south (4 wells) of the site and ambient air in the Hayward School are considered completed exposure pathways. The contaminants of concern in the northeast private drinking water exposure pathway are bromodichloromethane, chloromethane, and nitrate. Nitrate is the only contaminant of concern in the south private drinking water exposure pathway. The contaminants of concern in ambient air pathway are benzene, hexane, and pentane. There are community health concerns about learning disabilities, health effects of contaminated water, and the health and explosion hazards of vapor accumulation in their homes.

The WPL site is considered a public health hazard based on the exposure to nitrate in several private drinking water wells south of the site. The maximum concentrations of nitrates could result in methemoglobinemia in children less than six months old. The exposures in September 1986 of students and staff of Hayward Elementary School to benzene, hexane, and pentane vapors was an urgent public health hazard. However, no long-term health effects should occur. None of the other contaminants of concern represent a public health hazard.

Data on infant mortality, cancer deaths, and learning disabilities (LD) were reviewed. No conclusions could be made on the infant mortality and cancer death data. The percent LD for the new Hayward

School in 1990 was 10.2 %, which is the second highest percentage in the Sioux Falls School District. This percent LD is not statistically greater than other schools in the northern half of the district, but is greater than the average percent LD for the whole district. Data on LD for the years between 1986 - 1990 and by grade is needed to fully evaluate the possible relationship between the incident in 1986 and LD. While solvents are known to cause neurotoxic effects, it is not known whether exposure to these chemicals can contribute to the onset of LD.

The Agency for Toxic Substances and Disease Registry (ATSDR) recommends that EPA, in cooperation with the South Dakota Department of Water and Natural Resources (SDDWNR), better characterize off-site groundwater, soil, and air.

ATSDR's Health Activities Recommendation Panel (HARP) has evaluated the data and information developed in the Williams Pipe Line Disposal Pit Public Health Assessment. The panel determined that no further health education appears necessary at this time, but may be appropriated in the future. No health studies or investigations are indicated at this time.

BACKGROUND

The Williams Pipe Line Twelfth Street facility (WPL) in Sioux Falls, Minnehaha County, South Dakota has a long history of spills of petroleum products which have led to extensive contamination of area ground water. Spills of petroleum products alone are not covered under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Fertilizers, petroleum products, and pesticides were dumped and periodically burned at the disposal or burn pit located on the northeast corner of the facility. The disposal pit and the contaminants were proposed as a National Priorities List (NPL) site by the U.S. Environmental Protection Agency (EPA) in 1990. Because it is not possible to precisely identify whether contaminants are from the disposal pit or from other sources, this public health assessment will evaluate the possible health impact of the entire Williams Pipe Line Terminal facility.

A. Site Description and History

The WPL terminal facility is located at West Twelfth Street in Sioux Falls, South Dakota, SE1/4, Section 14 Township 101N, Range 50 West and is owned by Williams Pipe Line Company, of Minneapolis, Minnesota, a subsidiary of the Williams Companies. The site was owned until 1966 by Great Lakes Pipeline Company. The site was built in the 1940s. This site is currently used for the transport and the storage of petroleum products. In the past fertilizers were also transported and stored. Capacity at this facility is 25,326,000 gallons. Tanks range in size from 2,000 barrels (84,000 gallons) to 40,000 barrels (1,680,000 gallons) (1). Fertilizers, petroleum products, and pesticides were dumped and periodically burned at the disposal or burn pit located on the northeast corner of the facility. The terminal facility is fenced and has a security guard on the premises.

Currently there are nine workers on the site. They perform different materials handling, inspection, oversight, and security functions. There are also transient work crews that perform maintenance activities on the site, environmental consultants, and workers who service the various recovery systems on the site (3).

History of Contamination

Six major contamination events have been reported to the South Dakota Department of Water and Natural Resources (SDDWNR). In 1981 a spill from tank 4007 resulted in approximately 10,500

gallons of #2 diesel fuel being spilled on to frozen ground which limited the extent of contamination. WPL states that they recovered nearly all of the spill. In March 1983 a broken coupling resulted in the spill of approximately 300 gallons of #2 diesel fuel. WPL states that they recovered the majority of this spill by pumping with the rest being collected by absorbent material. In October 1983 an underground pipeline failed in the southeast corner of the WPL property near the truck loading rack with a resulting loss of 107 barrels (4,494 gallons) of #1 fuel oil. Remedial actions near the truck loading rack have resulted in the recovery of well over 6,900 gallons of product. In July 1984 a spill of 10,500 gallons #2 diesel fuel to soil and ground water occurred. Over half of that spill had been recovered in two years of remediation (1).

In 1984 hydrocarbons and nitrates were found in a water sample collected at Hayward School by a 6th grade class for a special project. Hydrocarbons were present at 5 parts per million (ppm) and nitrate-nitrogen was detected at 21 milligrams per liter (mg/L). The school discontinued the use of well water and was connected to the Sioux Falls municipal water supply in September 1984 (4).

In May 1986 a gasoline leak from Tank 1341 on the southwest corner of the WPL property occurred. The gasoline entered the ground water and caused the evacuation of a residence near the southwest corner of the WPL property. The exact amount of the spill was not established. This contamination was the source of exposure to hexane, benzene and pentane in the old Hayward School and a residence which posed fire, explosion, and health hazards (1, 5, 6). The school and residence have been leveled and the groundwater in the area is being treated. A new Hayward School was built to the northwest of WPL.

The final source of contamination investigated by the SDDWNR is the area known as the burn pit or disposal pit. In 1979, a monitoring well north of the northeast corner of WPL property showed hydrocarbon contamination. An investigation of the site showed an open dumping area in the northeast corner of the property called the burn pit or disposal pit. The burn pit is an open, unlined pit measuring 9 feet by 9 feet by 7 feet deep. The pit served as a collection for runoff from the WPL site and as a repository for condensate and sludges from the tanks. Trucks may have also dumped clean-out wastes in the burn pit before changing the products that to be transported. EPA believes that pesticides were also dumped in the pit in this way. Periodically the material in the pit was burned. SDDWNR notified WPL in 1986 that corrective measures must be taken immediately on the burn pit. The pit is currently inactive with a plastic cover on it (1).

Remedial Activities

Remedial actions at WPL include the installation of recovery systems to remove free product on the water surface, ground-water extraction wells to remove and treat contaminated aquifer water and hydraulic control and extraction wells to prevent the spread of contaminant plumes (7). These remedial actions were initiated by WPL and their environmental consultants, Bay West (1986-1988) and Leggette, Brashears and Graham, Inc. (1988-present) to comply with SDDWNR violation orders and a 1989 settlement agreement (8, 9).

In the northeast section of the property and off-site at Golden Sun Feeds, a recovery-well system removes free petroleum products from the shallow aquifer and treatment systems treat recovered ground water to remove hydrocarbon contamination. The treated water is disposed of into the sanitary sewer system. On the east and southeast corner of the WPL property recovery wells have been constructed. In addition, an interceptor trench, consisting of a French Drain system in the shallow aquifer, has also been installed to capture contaminants at the property boundary in the aquifer.

Recovery wells have also been placed adjacent to the old Hayward School. A line of wells was established to create a dynamic barrier to ground-water movement through the area. The Hayward School treatment system consists of an oil/water separator and an air-stripping column. Partially treated water is discharged into the sanitary sewer system but notes made on the system in 1987 state that the water was to be sufficiently treated to remove all hydrocarbons and allow the treated water to be infiltrated back into the Skunk Creek Aquifer (9).

Combustible-gas monitoring at Old Hayward School was also conducted by Bay West. A continuous, combustible-gas monitoring system was installed at the Golden Sun Feed (GSF) warehouse by GSF. GSF installed explosion-proof sump pumps and the sump areas were sealed to prevent infiltration of explosive vapors into the rest of the building (9).

B. Site Visits

On September 22, 1986, Mr. Joseph M. Posid of ATSDR, visited the old Hayward School in response to a request from the National Institute of Occupational Safety and Health (NIOSH) and the State of South Dakota to investigate complaints of illness, noxious odors and explosive conditions at the school. The principal of the school had called the Sioux Falls fire department who recorded the levels of explosive vapors in the school. The school had been evacuated on September 18, 1986. Mr. Posid met with representatives from the SDDWNR, the hydrologist from the South Dakota Geologic Survey, and the Sioux Falls Director of Public Health. He also spoke with the Sioux Falls Fire Marshall and conducted a public meeting with the state and local officials. He was asked to provide assistance on establishing safe or re-entry levels of vapors for school and he proceeded to the regional EPA headquarters to discuss possible EPA involvement (10).

On October 1-3, 1986, Dr. William Cibulas, Jr. and Mr. Clifford Moseley of ATSDR conducted a site visit to the old Hayward School to provide technical support the State and local officials in establishing the re-entry criteria for the school. Their second purpose of their trip was to evaluate any impact of the WPL spill on the surrounding community and assess possibilities for conducting an exposure assessment. They met with representatives from the EPA ERT, SDDWNR and the local fire department who was measuring the explosive levels of vapors inside the school. These tests were conducted with the school's ventilation system turned on. Mr. Moseley entered the school and turned off the ventilation system and determined through organoleptic testing (tasting and smelling) that the crawlspace under the school filled quickly with vapors (5).

Mr. Moseley and Dr. Cibulas also met with representatives from the Sioux Falls Public Health Department the Superintendent of the Sioux Falls School District. The EPA-ERT collected soil gas samples and reported the preliminary values to the ATSDR representatives (5).

On October 8 & 9, 1986, Dr. Jeffrey A. Lybarger and other ATSDR staff sampled the air at various locations inside old Hayward School. These included samples collected in student occupied and normally unoccupied areas. Measurements were taken with and without the building ventilation system operating. Sampling equipment was provided by NIOSH and consisted of battery-operated vacuum pumps and activated charcoal sampling tubes. The tubes were analyzed by NIOSH personnel. Air patterns were detected with standard smoke tubes and real-time organic vapor measurements were taken with a Century Organic Vapor Analyzer. No discussion was made of the calibration procedures for these instruments. Air sampling indicated the presence of benzene, n-hexane and elevated total hydrocarbon vapors in and under the school. The ATSDR representatives recommended that a

qualified engineering firm be enlisted to develop a means to control soil vapors beneath the school and that the effectiveness of the control systems be evaluated once they are in place (6).

On August 1-2, 1990, Dr. John Crellin, Ms. Rosalyn Lee, and Glenn Tucker of ATSDR conducted a site visit of WPL along with Lisa Reed from EPA. Contact was made with their representatives of the SDDWNR and the Sioux Falls City Health Department and City Attorney. Representatives of WPL and their environmental consultants, Leggette, Brashears & Graham, Inc., gave a tour of the facility to the ATSDR and EPA staff. They explained the operation of the interceptor trench and treatment facilities and showed ATSDR and EPA staff the burn pit. The old Hayward School recovery facilities were also toured. An interview a local TV reporter was given by Dr. Crellin, which included information on how to contact ATSDR with site specific problems (11).

ATSDR representatives made the following observations on the 1990 site visit.

- The WPL site itself is well fenced and a guard is on the site.
- While driving by the WPL-owned old Hayward School recovery site (school now evacuated) they observed that the fence was open and no WPL personnel appeared to be in the area.
- To the east and west of WPL are small stores, gasoline stations, storage facilities, and light industry. Large residential areas lie to the north and south within 1000 feet of the site.

The ATSDR representatives also conducted a search of the SDDWNR files for information pertinent to the public health assessment at that time (11).

In March 1991, Dr. Robin Brothers of the Oak Ridge National Laboratory, an ATSDR contractor, made an informal site tour of the WPL area with representatives of SDDWNR while on private business in South Dakota. At this time she observed the following from outside the WPL fence:

- No additional remedial activities (i.e., removal or treatment of soil) had taken place on the burn pit.
- The old Hayward School had been demolished and the area once covered by the school was bare soil with only a small shed covering the recovery well operation.
- The area once occupied by the residence on the southwest corner of the WPL property was grass covered and a small shed stood on this site also. This is now part of WPL property.
- Many large gravel pits are in very close proximity (less than 1/4 mile) to the WPL property. Many of these pits extended below the water level and had water standing in the bottom of them.

Dr. Brothers also learned that recently some other governmental agencies had been conducting community concerns surveys in the area regarding WPL. Upon her return to Tennessee, she investigated this comment and learned that the EPA regional office had been conducting these interviews and was able to obtain a copy of them (12).

C. Demographics, Land Use and Natural Resources

Demographics

The City of Sioux Falls population was 81,600 in the 1980 census. More recent census data were not available from the state or local officials at the time of the writing of this document due to disputes in the validity of the 1990 census data. The Director of Planning and Building Services for the City of Sioux Falls states that the population of Sioux Falls consists of approximately 96% Caucasian, 2.5% American Indian, 0.5% Black, and the remaining 1% consisting of Oriental and Hispanic persons. The area immediately surrounding the WPL property consists of a higher percentage of Caucasian persons as the minority population is primarily closer to the center of the city (13).

Land Use

The area around the WPL site (site refers to the entire WPL Twelfth Street Terminal property) consists of mixed residential, commercial and industrial uses. Large residential areas lie within 1000 feet to the north and south of the site. The residential area to the south is an older area with small low-to-middle-income-class, wooden dwellings, most of which are well maintained. To the north of the site lies a large mobile home park and middle class neighborhoods of brick and wood homes (11). The area is zoned for further residential development to the north and to the south. West Twelfth Street consists of a 400 foot commercial frontage and immediately north of the WPL property is another 400 foot commercial frontage. To the east is industrial commercial development and to the west residential development (13). Approximately 1 mile to the southwest is a large mobile home park that utilizes private well water (14). A survey of well users in the area of WPL identified approximately 150 businesses or residences within the immediate vicinity of the property (15). A conservative estimate of the total number of persons represented by this figure would be 300. This is probably an underestimate of the potentially affected population as the well survey was limited and residential development is continuing to grow in the area (14).

The distance from the site to the nearest residence is approximately 500 feet. The distance from the site to the nearest private well (in a business) is approximately 100 feet or less (17). A newschool has been constructed within 1 mile of the site (11).

Immediately to the south of the WPL property is a gasoline station which was thought to be contributing to the south-side off-site contamination. This station's tanks were determined to be tight and any leakage that may have come from this location was due to possible leaks in the pipe fittings at or near the tops of the tanks (4).

Natural Resource Use

Within the Skunk Creek Aquifer there are several possible sites affecting the water quality. Approximately 4 miles northwest of the site a former gravel pit was used as a dump site for manure. There is an increased nitrate nitrogen content in the ground water at this location. Approximately 1 mile to the northeast of WPL is a land fill which is also now resulting in an increase in calcium, sodium, chloride, dissolved solids, iron and manganese in the area groundwater. Rubble is still being dumped into abandoned gravel pits at this site (20). Gravel pit operations with 0.5 miles of the WPL property may impact water flow characteristics and groundwater quality (20).

The City of Sioux Falls has a municipal well in the Skunk Creek Aquifer approximately 1 mile from the WPL site. This well pumps a million gallons per day during the peak water use periods in the summer. It is mixed with finished water from other municipal wells before use. The city maintains a monitoring well approximately 0.5 miles from the site. Other city municipal wells are located in the Big Sioux Aquifer approximately 3 miles from the WPL property and the municipal system also uses some surface water from the Big Sioux River when the flow is sufficient (21, 22). Surface water from the Big Sioux River is also used to recharge the Big Sioux Aquifer (21).

Homes and businesses in the immediate vicinity of WPL use either municipal water or private well water or a combination of the two. The homes and businesses in the area have municipal water available to them via a curbside connection but there is no requirement to attach to the water line even though a property assessment is made for the connection (13, 14). These private wells are constructed in the Skunk Creek Aquifer, a shallow unconfined aquifer consisting of glacial till (4).

Skunk Creek, the nearest surface water body, is approximately 1 mile from the WPL site. Skunk Creek has been classified by the State of South Dakota as useful for marginal fish life propagation and limited contact recreation. This designation spans from its confluence with the Big Sioux River to approximately 4 miles upstream of the WPL site. In addition all streams in South Dakota must also be useable for irrigation, wildlife propagation, and stock watering (23).

The prevailing winds for the area taken at Foss Field Airport (less than 3 miles from the site) reported for the years 1971-1985 were from the south at 11 miles per hour. There is a distinct seasonal shift in wind direction with the months of November through April having prevailing wind from the northwest (24). The average annual precipitation for the area for 1987 was 24.12 inches (water-equivalent) with 48 inches of snow and ice (25).

D. State and Local Health Data

Health Data

Using state and local health databases it may be possible to determine whether the occurrence of certain health effects are greater than expected in the area surrounding the WPL site. This section identifies the relevant, available databases; their evaluation occurs in the Public Health Implications section. Although several contaminants of concern at the site are carcinogens, the State of South Dakota does not have a tumor registry (26). The State Registrar of Vital Records does publish an annual report of Vital Statistics and Health Status (27). A listing of cancer deaths by system by county are available from the State Registrar of Vital Records (26). Tumor registries are maintained by the following hospitals in Sioux Falls: McKennan Hospital (28), Sioux Valley Hospital (29), and the Veterans Administration Hospital (30). Access to these registries may be gained by submission of a letter stating the information desired and the intended use. Central Plains Clinic, a large medical clinic in Sioux Falls, cooperates with the North Central Cancer Treatment Group out of the Mayo Clinic in Rochester, MN. They do have a cancer data manager and all patients are followed until death (31). The annual report of Vital Statistics and Health Status lists the infant mortality for the state by county (27).

Learning Disabilities

Because of the complaints of possible learning disabilities (LD), the sources for information on educational outcomes was pursued. The City of Sioux Falls School Superintendent's Office was able to provide a 1990 listing of all schools in the city and their number of students with LD. The city did not have a historical record of the learning disabilities from previous years (32, 33). The State of South Dakota, Division of Elementary and Secondary Education, Office of Special Education maintains individual student files but compiles all data from individual schools in school districts into district wide reports (34).

COMMUNITY HEALTH CONCERNS

The following community health concerns have been gathered from site visits by ATSDR (11) and EPA personnel (35), well surveys conducted by SDDWNR (36), the city fire department (37), a transcript of a radio program about the WPL site (38), and personal communication with concerned residents (39).

1. Did the children and staff of the old Hayward School suffer any long-term health effects as a result of exposure to vapors in the school?
2. Will the exposure to vapors in the old Hayward School impair the children's learning ability in any way? Is the rate of learning disabilities 42% for children from old Hayward School?

3. Is the off-site soil contamination high enough to warrant concern?
4. Is it possible for site contaminants to pollute garden fruits and vegetables? Is it safe for me to garden?
5. Are the levels of vapors in residences and businesses high enough to be a concern?
6. Are workers on the WPL site in any great danger?
7. Is the municipal well in the Skunk Creek Aquifer safe now and for future consumption?
8. Will the residents and employees of the school and businesses in the area who consumed wellwater have any long-term health effects?
9. Should residents in the area continue using private wells?
10. Has the source of pesticide contamination in the burn pit area and off site been identified?
11. Is there any relation of the WPL site to dead trees to the west of the site?
12. Will children at a day care facility off the south side of the WPL site suffer any health effects from the site?

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Page last reviewed: April 1, 2010

Page last updated: April 1, 2010

Content source: Agency for Toxic Substances and Disease Registry

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