

# **PBB Contamination of Cattle Feed in Michigan, 1973**

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## **Introduction**

In 1973, Michigan suffered the worst chemical and agricultural disaster in the United States. It was through the diligence of one farmer, Frederic Halbert, who experimented and confronted the government for answers. Frederic Halbert earned a Master of Science degree in Chemical Engineering and had obtained a job with Dow Chemical Corporation (Enswiller, 1974). He decided after working at Dow Chemical that his first love was the farm. He decided to move his family to the farm that he owned along with his father, Frederic Sr., and his brother Mark. Frederick Jr. was married and had two young daughters at the time of the contamination. This document will show the effects of the contamination and how those affected have endured.

## **Background**

Between April 1973 and May 1974, Michigan suffered the worst chemical and agricultural disaster in the history of the United States (Reich, 1983). This disaster will forever be known as the PBB Contamination of Cattle Feed in Michigan. In the end over 33,000 cattle had to be destroyed and the dairy industry was never the same (Reich, 1983). It began in 1973 when Frederic Halbert a Battle Creek, Michigan farmer began noticing his herd was becoming lethargic (Enswiller, 1974). As the days progressed, the herd became more ill. His first inclination was that maybe there was something wrong with the newly purchased feed (Enswiller, 1974) Mr. Hilbert called his regular veterinarian, who determined that there was something definitely wrong with the herd, but he could not tell what it was caused from (Enswiller, 1974).

His first inclination was the same Mr. Halbert's; it must be the feed because the herd was healthy prior to the new shipment. Both Mr. Halbert and the veterinarian called Michigan Farm Services, the distributor of the feed and were told immediately that there was not a problem with the feed (Reich).

## **Halbert's Experiment**

Mr. Halbert, having a background in chemical engineering decided to do an experiment with the calves in his herd (Reich). He quarantined the calves from the rest of the herd and fed them only the newly purchase cattle feed (Enswiller, 1974). Within days, the calves were sick and eventually all fourteen of them died (Enswiller, 1974). This experiment confirmed Mr. Halbert's suspicion that the cause of the herd's illness was in fact the feed (Enswiller, 1974). After the first experiment, Mr. Halbert contacted Michigan Farm Services and informed of them of his results (Johnston, 1981). At this point, Michigan Farm Services refused to issue a recall and did not contact the Michigan Department of Agriculture to notify them of the concern (Johnston, 1981).

Mr. Halbert immediately contacted the United States Department of Agriculture in Ames, Iowa and had that laboratory test the feed. (Enswiller, 1974). It was at this point Mr. Halbert was contacted by Frank Mullens and was informed that the federal government could not afford to do the testing for a "private one person problem." (Enswiller, 1974) Mr. Mullens stated "His work

was beyond my authority to use funds. I know this sounds a little bureaucratic, but we only have certain authority” (Enswiller, 1974). Mr. Halbert then began making phone calls and found a few private research facilities that could do the testing at Mr. Hilbert’s expense (Enswiller, 1974). After several months, a break finally came when the Wisconsin Alumni Research Foundation found that indeed there was a foreign substance in the feed, but they could not tell what it was (Enswiller, 1974).

Mr. Halbert took that information and informed another USDA lab technician that was not connected or under the authority of the Ames, Iowa laboratory. By mistake, the lab technician had left some type of chemical on the feed for too long of a time period and thus the answer was found (Enswiller, 1974). The prolonged use of the chemical resulted in the findings that the cattle feed contained Polybrominated Biphenyls (PBB) (Enswiller, 1974). The lab technician had noticed that this chemical was the same type that he had tested earlier for Michigan Chemical Corporation when they initially introduced the chemical (Enswiller, 1974). By this time, his herd was becoming increasingly sicker and was developing these symptoms; loss of hair and noticeable sores on the skin, deformed hooves on adult cattle that were curling up, loss of milk production as much as 40%, loss of appetite, difficulty conceiving, still births and actual live births with deformed calves (everything2.com).

### **How the Disaster Occurred**

It was in April 1973, when a worker mistook a bag of Polybrominated Biphenyl for the feed supplement magnesium oxide (Reich). The Polybrominated Biphenyl was known as FireMaster, which is a fire retardant that is used in children’s clothing (Reich). The feed supplement went by the brand name Nutrimaster. The mistake Michigan Chemical Corporation in St. Louis, Michigan and Michigan Farm Services in Lansing later swore to in court documents was that both had employed workers who could not read. (Reich) Michigan Chemical Corporation also claimed that there was a work stoppage and the economy of the country was in a deep recession. It was the intention of Michigan Chemical Corporation to cut back on costs and they did. One cutback was to buy the same color of bags with the same colored lettering for both chemicals. This was a problem because Michigan Chemical Corporation also employed workers who could not read and relied on the colors of the bags to tell the difference. There were also different names being used for Nutrimaster and when several of the workers who could read notified their supervisor that a new product came in the warehouse called FireMaster, they were told that this was just another name for the nutrient. Thus, FireMaster was added to the cattle feed and shipped statewide. Michigan Farm Services’ response was that there may be a problem with the feed and they contracted a lab to test the feed. Michigan Chemical Corporation denied that there was anything wrong with the feed. It was at this time that Mr. Halbert contacted the Federal Drug Agency and they sent an inspector immediately to the site of the packing plant, Michigan Farm Services. It was here that the inspector found a half bag of opened PBB and thus the cause of the herd’s illnesses and deformities were finally identified. This was only the start of the problems for most of the citizens of the State of Michigan and the farmers. By the time this problem was discovered, 15 farms had been contaminated and 98% of the citizens of the State of Michigan had been contaminated with PBB through the ingestion of beef, milk and dairy products, along with other animals and their products. The PBB contamination was not only confined to the dairy herds. Other animal feed went through the same process and machinery as the cattle and theirs was also contaminated.

### **Political Climate of the United States In 1973**

The year 1973 saw many drastic changes in the way the citizens of the United States viewed their political leaders. Much was discussed on the political corruption of our leaders. Any comments and ideas the politicians made and suggested were met with skepticism. This was the beginning of Watergate and the subsequent resignation of the President of the United States, Richard Nixon. So, when it was stated that there was nothing wrong with the feed, it was most likely met with skepticism. Two months after the discovery of the PBB in the feed and the knowledge that the citizens of Michigan were contaminated with PBB, the federal government sent a crew of bureaucrats to Michigan to meet with the citizens. The bureaucrat's goal was to inform the citizens that there were no ill effects of PBB exposure and it would definitely not cause cancer. This was met with hysteria as most people knew that there was no scientific data to back these statements up because fire retardant was a relatively new chemical.

### **Aspects**

Many tests have been conducted by scientists that have concluded the following;

- Early onset of menstruation in girls in Michigan at the age of 11 compared to 12.88 nationally (www.Salon.com).
- Early onset of menopause in women in Michigan, typically at age 45-50, whereas, nationally the age is 50-55. (www. obgyn.net)

A federal research laboratory found that the chemical PBB may have a wide range of harmful health effects of humans, in addition to the finding that the chemical causes cancer in humans (Magnusson, 1981). The form of liver cancer found among the laboratory animals that ate the PBB is fairly rare in the United States and is considered untreatable (Magnusson, 1981).

Six hundred rats and mice were fed normally but given varying doses of a solution of corn oil and PBB through a tube in their stomach for six months, then allowed to live out their average life span of eighteen months. (Magnusson, 1981). Then their organs and blood were tested for the effects of PBB. (Magnusson, 1981). Scientists at the research lab were hesitant to say that a substance will cause cancer in humans if it causes cancer in lab animals (Magnusson, 1981). However, the researchers say that this is true in 18 out of 19 cases studied (Magnusson, 1981). Because of the incidence of liver cancer increased among the mice and rats according to the amount of PBB ingested, Michigan farmers are more likely to be the most threatened (Magnusson, 1981).

A state study that discounted possible human illness caused by a fire retardant mixed in cattle feed is completely invalid (Johnston, 1981). Dr. Walter Meester of Blodgett Memorial Hospital in Grand Rapids said he came to that conclusion because some persons in a control group who were thought not to have been exposed to the chemical actually had the substance in their blood. (Magnusson, 1981). One of the study's directors stated, "This does muddy the waters a bit" (Magnusson, 1981). The Public Health Department (state) maintains on the basis of its study, that it can find "no pattern of illness" attributable to PBBs (Johnston, 1981). In the state study, all but three of the 110 exposed persons in all had measurable levels of PBBs in their blood (Johnston, 1981). In the control group 83 of the 104 people tested had PBBs in their blood. The control group had 30 children all of whom had PBB in their blood. (Johnston, 1981).

A U.S. Food and Drug Administration official said Michigan farms are so contaminated with PBB that it is now impossible to eliminate traces of the fire retardant from all foods produced on them (Haradine, 1976). The guidelines in 1976 banned foods with more than 3 parts per million of PBB (Haradine, 1976). A panel named by then Governor William Milliken had

recommended that the level be lowered to the lowest amount that can be accurately measured, which in effect would ban foods with even traces of the chemical (Haradine, 1976).

### **Disposal Sites**

The Michigan Department of Environmental Quality stated that there were only two sites in Michigan chosen as burial pits, Mio and Kalkaska (mdeq.gov). Further investigation at the Calhoun County Health Department in Battle Creek, Michigan revealed more burial sites of animal carcasses and feed. Those sites are: Pennfield Landfill in Calhoun County, Michigan, Smiths Creek Landfill in Kimball Township, St. Clair County, Forest Waste Disposal, Otisville, Genesee County, three sites in Sanilac County and the State of Nevada.

All health departments in the state were contacted and only two responded. In the burial pits; 33,000 cattle, 1.5 million chickens 1,470 sheep, 5,920 hogs, 865 tons of feed, 17,900 pounds of cheese, 2,630 pounds of butter, 34,000 pounds of dry milk and 5 million eggs were buried.

#### *Kalkaska County: Kalkaska Michigan*

Michigan decided to locate an environmentally safe site for burial of carcasses (Shah, 1978). After reviewing several locations and existing landfills in Michigan, the site in Kalkaska County was chosen and test drilled in order to determine the long range protection to ground waters of the area (Shah, 1978). The 25 acre site is located on the state-owned land in E ½. SE ¼. Section 10, T25N, R5W, Garfield Township, Kalkaska County, Michigan (Shah, 1978). Prior to hydrology and topography selecting the below location (see Figure 1) the preliminary factors considered were geology, hydrology and topography, isolation from nearest inhabitants and surface water bodies, availability of access roads and natural openings, wildlife habitat, and forest management (Shah, 1978). The site in Kalkaska County satisfied all of the above factors; further, a few test bores were obtained, and four groundwater observation wells were installed at three locations (Figures 2 and 3) for the accurate determination of subsurface geology and groundwater conditions (Shah, 1978).

The surface and near surface sediments in major parts of Michigan are of glacial origin and the topography of the area is gently rolling with an average elevation of 1271 feet above the sea level at the site (Shah, 1978).

The subsurface test hole and well data show that the glacial sediments underneath and adjacent areas are predominantly sandy with some interbedded silts and clays (Figure 3) (Shah, 1978). Boring logs further indicate that at the depth of about three to five feet thick there is sandy silt and clay layer which continues throughout the disposal area (Shah, 1978). In some areas, traces of silt intermixed with sand are encountered below 40 feet and all the way down to the water table (Shah, 1978). Subsurface data from monitoring wells to the west and northwest indicate silt and clay material slowly disappears in that direction (Shah, 1978). Initially, observations wells were installed at three locations as shown in Figure 2 in order to determine the accurate depth of water table and the direction of groundwater flow (Shah, 1978). The static water levels in these wells indicate that water table is about 95 feet below the ground surface and the direction of flow is N40°W with the rate of less than 1ft/day (Shah,1978). Data from additional monitoring wells (indicated by triangle and letter M in figure 2) located in the northwesterly direction have confirmed groundwater flow direction and also provided more subsurface information regarding the composition of glacial materials and aquifer thickness (Shah, 1978). Two monitoring wells (M-4d and M-9d) extend to the depth of about 150 feet, indicating an aquifer thickness of at least 50 to 60 feet (Shah, 1978).

Further investigation at the Calhoun County Health Department in Battle Creek, Michigan revealed more burial sites of animal carcasses and feed. Those sites are: Pennfield Landfill in Calhoun County, Michigan, Smiths Creek Landfill in Kimball Township, St. Clair County, Oscoda Dump in Oscoda County, Forest Waste Disposal, Otisville, Genesee County and to the State of Nevada.

#### *Pennfield Landfill, Calhoun County*

Pennfield Landfill was licensed by Michigan Department of Natural Resources on October 6, 1969. The property is the North ten acres of the northwest one-quarter of the northwest one-quarter of Section 26 and the south five acres of the north fifteen acres of the northwest one-quarter of Section 26, Town 1, South, Range 7, Pennfield Township, Calhoun County. The site for the disposal was 10' wide, 9' deep and 30' long. Burial was 15-20' deep.

Pennfield Landfill was owned by Wes Carter of Battle Creek. It had been cited several times by the Calhoun County Health Department for poor maintenance and exposure of contaminated bags of grain. Residential well testing near the landfill had been done 29 times between 1975 and 1988. The results of each test indicated no detection of PBB. The tests were done by Laboratory and Epidemiological Services of the Michigan Department of Public Health. A temporary injunction was ordered on July 29, 1974 until August 14, 1974 by the Township of Pennfield to halt the delivery of contaminated grain to the Pennfield Landfill. The amount of contaminated grain dumped at the landfill was 1,530 tons (wbck.com). In health department reports, it is noted Carl Okar dumped 80 head of cattle at this landfill.

Apparently, Farm Bureau balked at or delayed payments to Calhoun County. In a letter to Michigan Farm Bureau, the Health Department stated "All of the feed was not from Calhoun County and Calhoun County taxpayers should not have to bear the supervision costs for burying out of county contaminated feed." According to Calhoun County Health Department reports for Pennfield Landfill, it received contaminated grain from Elkton Cooperative (Huron County), Remus, Kent City, and Ithaca.

A letter dated August 14, 1975 was sent by Calhoun County Health Department to inform the Michigan Department of Natural Resources that effective October 15, 1975 it will no longer accept hazardous waste. A final cover for the landfill was ordered October 13, 1975. A letter dated April 29, 1977 from the Calhoun County Health Department to Wes Carter, stated "the final cover was not in compliance with the required cover on the agreed date". It was recommended that a hearing be held with the Resource Recovery Commission to make a determination on violation of Act 87, P.A. 1965, Solid Waste Management Systems, Rule 23, Final cover (8).

The landfill is now officially closed.

### *Forest Waste Disposal, Genesee County, Michigan*

There was very little information that could be found regarding this site other than the county of Genesee cooperated fully with the Michigan Department of Natural Resources and the Environmental Protection Agency. The site is now officially closed.

According to memos to Calhoun County from then Attorney General Frank Kelley, there was a landfill located in Genesee County, Michigan named; Forest Waste Disposal, 8359 E. Farrand, Otisville, Michigan. Kelley noted Smiths Creek Landfill located in Kimball Township, St. Clair County.

### *Oscoda County, Mio Michigan*

Burial of cattle were in three clay lined pits ([ludingtonnews.com](http://ludingtonnews.com)). Judge Alan Miller awarded \$20,000 to the Oscoda PBB Action Committee ([www.ludingtonnews.com](http://www.ludingtonnews.com)). Judge Miller stated “the group had performed a service even though they did not prevent the burial of cattle in one of three clay lined pits.” ([www.ludingtonnews.com](http://www.ludingtonnews.com)).

Michigan Department of Natural Resources buried 1500 cattle here before Attorney General Frank Kelley intervened and suggested that the cattle should be incinerated ([www.ludingtonnews.com](http://www.ludingtonnews.com)).

### *Smiths Creek Landfill, Kimball Township, St. Clair County, Michigan*

This landfill is located at Griswold Road, Kimball Township, and St. Clair County. There is no information on what was buried, the amount or the disposal method.

### *Sanilac County, Michigan*

The health department director at the time of the incident, who is now retired, will not return calls. Locations of the sites are only speculative at this time, as residents have given me the location. Two of the sites are in the Brown City area and one site is in the Argyle area.

### *Nevada*

In January 1980, the Michigan Department of Natural Resources announced that 2,000 additional cattle will be shipped to Nevada for disposal ([www.ludingtonnews.com](http://www.ludingtonnews.com)). There is no additional information available on this site.

## **Regulations**

Michigan Department of Natural Resources regulations for landfills accepting feed:

- Require at least a twelve foot separation between the trench bottom and the water table
- Require an immediate two foot earth cover after deposition
- Utilize the “Hazardous Waste Land Disposal Report form dated 10/73
- Maintain 500 feet isolation from any surface water, water well or building

## **Method of Disposal**

In most cases, PBB-contaminated animals were brought alive to the Kalkaska and Mio sites and then killed in a humane fashion in the stockade area under the supervision of veterinarians from the Michigan Department of Agriculture (Shah, 1978). Afterwards dead animal carcasses were deposited side by side to form one layer in a 15 ft deep trench excavated in dry, sandy material as shown in Figure 3 (Shah, 1978).

Body cavities of animal carcasses were cut open for the escape of gases prior to placing 2ft. of sand immediately over them followed up by complete filling of trenches with at least 10 ft of sand within 24 to 48 hrs (Shah, 1978). After all the trenches in designated disposal area

(Figures 2 and 3) were filled, the whole area was graded in order to provide adequate slopes for surface water runoff (Shah, 1978) Then the polymer bentonite soil sealant (Dowell M-179 product) was evenly spread at a rate of 35 tons per acre and blended in with 4 to 6 inches of sand (Shah, 1978). This seal was installed to prevent surface water infiltration into disposal trenches and provide increased run-off towards sealed drains along the perimeter of the disposal areas (Shah, 1978). Perimeter drains discharge surface water into shallow seepage basins, located away from the disposal areas (Shah, 1978).

Further, on the top of the soil sealant layer, sand cover 2 ft thick was placed and the final surface was seeded with mixture of grasses in order to restore the landscape in its natural state which provides an excellent wildlife opening in a heavily forested area (Shah, 1978). Rainfall in this part of the state averages 32 inches per year (Shah, 1978). It is estimated that two-thirds of the rainwater is lost in the form of evapotranspiration and one third of the rainwater is partly lost as runoff from the site above soil sealant layer and partly absorbed by the root system developed by the vegetation, thus reducing infiltration potential into carcasses containing PBBs and increasing protection to the groundwater of the area (Shah, 1978).

The Phase I disposal area first received approximately 10,000 to 11,000 animal carcasses, most of which had PBB levels above 1ppm in fat (Shah, 1978). The Phase II disposal area received close to 20,000 animal carcasses, mostly having PBB levels above 0.3ppm but in general less than 1ppm in fat. The Phase I area appears to be larger than Phase II but it received almost half the number of animals received by Phase II area (Shah, 1978). This happened because in the initial stages of disposal operation lot of space between trenches was not utilized due to lack of proper planning of trench locations, but the trench depths were still maintained at 15 ft below ground level (Shah, 1978).

### **Groundwater Monitoring**

In addition, to the initially installed four observation wells, 12 more wells have been installed in the direction of groundwater flow to provide a complete groundwater monitoring system (Shah, 1978). This system will be used to monitor water table fluctuations and quality of groundwater (Shah, 1978). Out of a total of 16, wells M-4d and M-9d provided monitoring points 45 to 55 ft. below the water table (Shah, 1978). Monitoring data from 1974 to 1978 shows that water table elevation in this area fluctuates to 1ft and there has been no degradation in groundwater quality from PBBs or any other contaminants from the disposal area (Shah, 1978).

### *Gratiot County, St. Louis, Michigan*

Michigan Chemical Corporation was purchased by Velsicol Chemical Company shortly after the disaster and operations were moved to Chicago. Vesicol was the subject of a manager buyout in 1986 and then was acquired by private equity firm Arsenal Capital in 2000. Three years later, Arsenal split the business and created a new company called Genovique Specialties. ([www.bizyahoo.com](http://www.bizyahoo.com)). Three sites in the county have been linked back to the company and are listed on the National Priorities List (NPL) as Superfund Site ([www.epa.gov](http://www.epa.gov)). They are the Factory Site, Gratiot County Golf Course and the Gratiot County Land Fill ([www.epa.gov](http://www.epa.gov)). Michigan Chemical Corporation dumped their hazardous waste at these sites and was required to clean the sites ([www.epa.gov](http://www.epa.gov)). The county golf course was the result of the cleanup efforts. ([mdeq.gov](http://mdeq.gov)).

The Pine River ran adjacent to Michigan Chemical Corporation and is the subject of a massive cleanup effort. This cleanup effort has been coordinated by The Pine River Superfund Cleanup Task Force, a citizens' advisory group. This cleanup has cost over 100 million dollars

and has included installation of sheet piling, dewatering and dredging operations. ([www.stlouismi.com](http://www.stlouismi.com)).

#### *Gratiot County Landfill, St. Louis, Michigan*

The 40 acres landfill is located in SW1/4, SE 1/4, Section 30, T12N, R2W, Bethany Township, Gratiot County, Michigan (See Figure 1) (Shah, 1978). The landfill is owned by the County and is situated southeast of the City of St. Louis (See Figure 4) (Shah, 1978). After learning about the presence of 269,000 pounds of waste containing 161,40 to 188,300 pounds (60 to 70%) of polybrominated biphenyls in the landfill, in March of 1977 the Michigan Department of Natural Resources started preliminary (Phase I) hydrogeological investigation of the site (Shah, 1978). The investigation was conducted by locating PBB wastes in the landfill and determining possible contamination of the ground and surface waters of the area. The Phase I study was completed in July of 1977 (Shah, 1978).

The landfill is located on a rather narrow northwest-southeast trending (See Figure 4) Gladwin recessional moraine of the Saginaw ice lobe of the middle Wisconsin age (Shah, 1978). The thickness of the glacial drift in the site area is approximately 400 feet underlain sandstone and stable bedrock which is part of the Grand River formation of Late Pennsylvanian Period (Shah, 1978). Well records in the area indicate that upper part of the glacial drift is composed predominantly of clay and silt tills which are interbedded with stratified and sorted sand and gravel deposits (Shah, 1978).

#### **Outcome**

Since the “incident” as Farm Bureau calls it, Michigan Farm Services had over one thousand claims filed by farmers seeking damages in addition to clean up expenses and legal fees, which severely impacted the company financially. ([www.michfb.com](http://www.michfb.com))

Finally adverse economic conditions, high interest rates and lost sales cost Michigan Farm Services to sustain significant bottom line losses from 1974-1981 ([www.michfb.com](http://www.michfb.com)) Michigan Farm Services filed for reorganization Chapter 11 Bankruptcy in 1982. They emerged from bankruptcy protection in 1984 with a new name, AgraLand Incorporated. This business has failed. ([www.michfb.com](http://www.michfb.com))

#### **Mitigation**

Since the disaster, many new laws were enacted to protect the citizens, the environment and to offer remediation to contaminated sites. Those laws are the Clean Water Act of 1973, the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), the Resource Conservation Recovery Act of 1977, the Safe Drinking Water Act of 1974, Superfund Reauthorization Recovery Act of 1986 (SARA) and the Toxic Substance Control Act of 1976 (TOSCA) (Repic) The best known is the CERCLA and SARA. Both require a remediation plan and cleanup of a contaminated site. CERCLA requires notification of any release of a reportable release of a hazardous material. (Repic) It also established a trust fund. SARA amplified CERCLA requirements. (Repic) It requires certain businesses to prepare inventory reports listing hazardous materials in their possession, (Repic). It assists in the development of community emergency response plans and the reporting immediately of hazardous releases. (Repic) CERCLA also provides a federal “superfund” to clean up controlled or abandoned hazardous waste sites as well as accidents, spills and other emergency releases. (Repic) SARA also created a tax on the chemical and petroleum industries for the cleanup of a site. (Repic). None of the environmental laws compensate humans for their illnesses associated with chemical disasters. ([www.aliciapatterson.org](http://www.aliciapatterson.org))

The other area that is not covered is the moral and financial responsibility of the chemical companies and their stockholders, owners and officers. Some countries hold these individuals responsible, not only financially but criminally for anything that occurs at a site. Maybe if someone could be held responsible for the outcome of their company, they will be extra diligent in keeping the citizens and the environment safe.

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