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HAZARDOUS WASTE DISPOSAL DAMAGE REPORTS

This publication (SW-151.2), the second in a series of reports to document incidents of improper land disposal of hazardous wastes, was prepared by the Office of Solid Waste Management Programs

U.S. ENVIRONMENTAL PROTECTION AGENCY
1975

HAZARDOUS WASTE DISPOSAL DAMAGE REPORTS

On June 30, 1973, the U.S. Environmental Protection Agency (EPA) submitted a report to the U.S. Congress on the subject of hazardous waste disposal as had been required by the Solid Waste Disposal Act Amendment of 1970.[1] That report concluded that the prevailing methods of land disposal of hazardous wastes are largely inadequate and cited numerous case studies pertaining to improper hazardous waste management. Since the 1973 Report to Congress, EPA has continued to study hazardous waste disposal. A portion of these studies has consisted of more detailed investigations of improper land disposal practices to determine their impact on public health and on the environment. Case studies have been compiled within the framework of these investigations.

The problems associated with improper land disposal of hazardous wastes--unlike the problems of air and water pollution--have not been widely recognized by the public, although the damages may be as severe and difficult to remedy. In addition, the hazardous waste disposal problem continues to become even more significant, as the progressive implementation of air and water pollution control programs, ocean dumping bans, and cancellation of pesticide registrations results in increased tonnage of land-disposed wastes, with adverse impact on public health and the environment. The problem is manifested in groundwater contamination via leachate, surface water contamination via runoff, air pollution via open burning, evaporation, sublimation and wind erosion, poisonings via direct contact and through the food chain, and fires and explosions at land disposal sites.

The objective of publishing these damage reports is to bring about national awareness of the problem, which is essential to its solution. These reports will be published from time to time as resources permit. No systematic effort has been made to concentrate on any one parameter of interest, be it geographical, industrial, type of disposal site, or type of damage. Similarly, it is not the purpose of this series of reports to single out any particular person, firm, or industry. Cases are investigated as information becomes available. The only criteria used in the selection of incidents for these reports are:

- severity of damage
- availability of supporting information
- availability of EPA personnel for investigation

The data base for these damage reports varies widely. In some instances, official public records will be available for documentation; however, in most cases the reports will have to be based on inspection

by EPA personnel, interviews with parties involved or having first-hand knowledge of specific incidents, technical investigations by consulting firms, newspaper accounts, etc.

The authority for the publication of such reports derives from Sec. 204 (a)(1) and (b)(1) of the Solid Waste Disposal Act of 1965 (P.L. 89-272)--as amended by P.L. 91-512, P.L. 93-14, and P.L. 93-611.

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HAZARDOUS WASTE DISPOSAL
DAMAGE REPORT

January 1976

Dioxin Poisoning
Caused by Improper Waste Disposal in Missouri

1. Personal Damage - Toxic illness of varying degrees affecting ten persons. The worst illness occurred in a six-year-old girl who suffered an inflammatory reaction of the kidney and bladder bleeding, requiring hospitalization and surgery. Less severely affected persons developed diarrhea, headaches, nausea, polyarthralgias, and persistent skin lesions.

2. Environmental Damage - Contamination of the soil with an extremely toxic substance in three horse arenas and a farm road. The death of six dogs and twelve cats, and the destruction of a large number of birds and insects.

3. Economic Damage - The death of at least 63 Appaloosa and quarter horses, which resulted in loss of business and subsequent sale of one of the horse arenas. Also, medical expenses and cleanup costs. The estimated total financial loss, based on filed lawsuits (excluding punitive damages), is close to $500,000.

4. Cause of Problem - Contact with soil containing 2,3,7,8-tetrachlorodibenzodioxin (TCDD, commonly referred to as dioxin), a contaminant in the waste oil which was sprayed in three horse arenas and a farm road as a dust control measure.

5. Type and Quantity of Hazardous Waste - Approximately 4,000 to 5,000 gallons of waste oil containing about 300 ppm dioxin was sprayed on the affected areas.

6. Source of Waste - The waste oil was obtained by Bliss Waste Oil Co. from North Eastern Pharmaceutical and Chemical Co., where industrial waste residues from hexachlorophene production were kept in a storage tank.

7. Date of Incident - The dioxin-contaminated waste oil was sprayed on three horse arenas and a farm road in May and June 1971. Birds died within three days and

the first horse within four weeks of the spraying. Horses exposed to the contaminated arena soil in May and June 1971 continued to die as late as January 1974.

8. Location - Near the towns of Moscow Mills, Fenton, New Bloomfield, and St. James, Missouri.

9. Status - Remaining 4,600 gallons of dioxin-contaminated distillate residues are in an industrial storage tank. State and Federal officials are actively seeking a safe disposal method for the material.

10. Remedial Action Taken - The contaminated soil was excavated during the period from October 1971 to August 1974 and graded under a new concrete highway, dumped at a sanitary landfill, and in one case (before the identification of dioxin) used as residential landfill.

11. Legal Action Taken - Two law suits, for a total of $954,000 in compensatory and punitive damages, have been filed by the former owners of one of the horse arenas against Bliss Waste Oil Co., North Eastern Pharmaceutical Co., and Independent Petrochemical Corp. Also, a lawsuit for $60,000 has been filed by several horse owners against one of the other two horse arenas.

12. Narrative - In August 1971, a six-year-old girl was admitted to a Missouri children's hospital with severe bladder pain, urinary urgency, and inability to pass urine. She was listless, had been bleeding from the nose, and had diarrhea and a headache. Over a period of several hours she gradually was able to void in small amounts, but her urine was grossly bloody. Her case was diagnosed as acute hemorrhagic cystitis with signs of focal pyelonephritis.

    A significant clue in this case was that the child lived on a farm where many animals had recently died. Following the spraying of the farm's horse arena in late May with waste oil for dust control, numerous birds, cats, dogs, and horses developed a mysterious fatal illness. The child was known to have played frequently in the soil of the horse arena during the summer, as in a sand box.

Analysis of soil samples taken from the arena initially identified a complex mixture of organic compounds, including trichlorophenol and polychlorinated biphenyls. The toxic agent responsible for the outbreak of poisonings was ultimately identified as dioxin, one of the most toxic chemicals known. Based on animal studies, both the oral and the dermal lethal dose for humans have been established in the range of micrograms per kilogram body weight.

Dioxin is a by-product from the manufacture of the herbicide 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and related compounds. The Hoffman-Taff Company's production of 2,4,5-T in Verona, Missouri, was terminated in February 1969. The company was subsequently acquired by Syntex Agribusiness, Inc. The new owners of the manufacturing facility sold the equipment and leased the plant space to the North Eastern Pharmaceutical and Chemical Co. (NEPACCO) which produced trichlorophenol as an intermediate for the manufacture of hexachlorophene. The toxic by-product dioxin is also formed in the manufacture of trichlorophenol. The residues containing a high concentration of dioxin were emptied for about 1 1/2 years into a large storage tank on the site.

Periodically, the residues were hauled away by a disposal company to Louisiana for incineration. In 1971, NEPACCO contracted with Independent Petrochemical Corp. (IPC) of St. Louis for $4,625 to dispose of the residues. Not actually equipped to handle waste disposal, IPC subcontracted with the Bliss Waste Oil Co. to remove the material. The company is owned and operated by Russell Bliss, who deals in waste oil, lubricants, organic solvents, and transformer oils generated by automobile service stations and industrial sources. For many years, Mr. Bliss has been spraying the nonrefinable grades of waste oils on horse arenas as a means of dust control.

From February to October 1971, the Bliss Waste Oil Co. transferred six truckloads (approximately 18,000 gallons) of industrial residues containing about 300 ppm dioxin from NEPACCO's storage tank in Verona to its own storage tanks in eastern Missouri. Mr. Bliss received no payment from IPC but was paid by the horse arena owners where he sprayed the oil. Three horse arenas and a farm road on Mr. Bliss' own property are known to have received the dioxin-contaminated oil. The dioxin concentration of the soil in the most seriously affected horse arena was analyzed at about 30 ppm. The overall toll in the

four disposal areas can be summarized as follows: ten persons developed toxic symptoms (two children became seriously ill), and at least 63 horses died along with 6 dogs, 12 cats, 70 chickens, hundreds of birds, and numerous rodents and insects. In addition, there were 26 known abortions and 6 birth abnormalities among the horses. The toxicological as well as other aspects of this case have been well documented.[2,3]

NEPACCO went out of business in December 1971. The Verona manufacturing facilities reverted to Syntex Agribusiness, Inc., which disclaims all legal responsibility for the inherited 4,600 gallons of toxic residues in the industrial storage tank. Syntex has expressed willingness, however, to pay for the safe disposal of the wastes. Several alternative disposal methods have been considered, including incineration at sea.

HAZARDOUS WASTE DISPOSAL
DAMAGE REPORT

January 1976

Contamination of Groundwater
Beneath the Rocky Mountain Arsenal and Surrounding Area

1. Personal Damage - None

2. Environmental Damage - Contamination of 30 square miles of a shallow water table aquifer. Contamination of soil by toxic substances (aldrin and dieldrin) in the vicinity of a formerly used unlined holding pond. Mild earthquakes in the vicinity of the Arsenal. Occasional waterfowl kills.

3. Economic Damage - Contamination and temporary abandonment of 64 domestic, stock, and irrigation wells. Damage to crops on 6 1/2 square miles of farmland adjacent to the Rocky Mountain Arsenal. The loss of one million dollars for the construction of a waste injection well which had to be abandoned when the deep-well disposal resulted in earthquakes.

4. Cause of Problem - Infiltration of industrial wastes from unlined holding ponds into a shallow water table aquifer and subsequent migration of the contaminants through the groundwater. Deep-well injection of large volumes of liquid wastes, resulting in earthquakes.

5. Type and Quantity of Hazardous Waste - A complex mixture of chemical by-products from the manufacture of pesticides and herbicides, and from the past manufacture and destruction of some chemical warfare agents. Substances identified in the groundwater include aldrin, dieldrin, endrin, diisopropylmethylphosphonate (DIMP), and dicyclopentadiene (DCPD). Volume of waste infiltration is unknown due to the unavailability of records of amounts of wastes discharged into the various holding ponds.

6. Source of Waste - Chemical manufacturing operations at the Rocky Mountain Arsenal, carried on by the U.S. Army Chemical Corps and the Shell Chemical Company.

7. Date of Incident - Disposal of chemical wastes in unlined ponds took place between 1943 and 1957. The first reported damage to grain crops dates back to 1951.

8. Location - Rocky Mountain Arsenal and surrounding area, between Denver and Brighton, Colorado.

9. Status - Although wastes have not been stored in unlined holding ponds since 1957, groundwater contamination of significant areal extent is still evident.

10. Remedial Action Taken - Construction of an injection well and a 96-acre asphalt-lined reservoir with a holding capacity of 240 million gallons. Extension of the influent pipe to the reservoir and replacement of 800 feet of chemical sewer line.

11. Legal Action Taken - Suits filed by landowners against the Rocky Mountain Arsenal for well water contamination and crop losses have resulted in payment of over $165,000 in damages by the Federal Government. A recent suit brought by Larry Land, a farm owner to the north of the Arsenal, is still pending. He alleges that contaminants originating from the Arsenal have polluted his well water, causing crop and livestock losses.

12. Narrative*- The Rocky Mountain Arsenal was established in 1943 and for several years was operated by the U.S. Army Chemical Corps for the production of chemical warfare agents. In the late 1950's, most of the industrial facilities were leased to the Shell Chemical Company, which has utilized them for the manufacture of pesticides and some herbicides. The Arsenal occupies 27 square miles of the South Platte River Valley between Denver and Brighton, Colorado. From 1943 to 1957, canals and ditches were used to convey liquid chemical wastes from various chemical processes to unlined holding ponds for storage. Since the river valley is underlain by alluvial deposits which act as a shallow water table aquifer, waste liquids infiltrating into the soil moved directly into the groundwater.

    First indications that contamination of the groundwater had taken place were in 1951. At that time, damage to crops irrigated with water from shallow wells in an area to the northwest of the Arsenal property became evident.

*For further details, see References 4 to 9.

During subsequent years, the crop damage extended to several farms in the area. The crops that had become affected included sugar beets, pasture grasses, alfalfa, corn, and barley. Those crops irrigated with contaminated well water exhibited yellow foliage, retarded growth, and consequently low yields. Complaints and damage claims against the Arsenal prompted the U.S. Army Chemical Corps to engage a firm of consulting engineers to investigate the problem in 1954. Subsequent investigations were performed by the U.S. Geological Survey, the Colorado State Department of Health, and the U.S. Public Health Service. By means of a well sampling program, the holding ponds employed at the Arsenal were identified as the source of contamination.

After having defined the problem, technical studies resulted in remedial action in 1957, six years after the initial indications of groundwater damage. A 96-acre asphalt reservoir with a capacity of 240 million gallons was constructed, into which the industrial wastes have been conveyed by pipeline and by tank trucks. In addition, a 12,045-foot deep-injection well was constructed in 1961 for the purpose of waste disposal. However, correlation of the injection of large volumes of liquid into the well with earthquakes in the Denver area caused this operation to cease in 1966.

Wells sampled in a 1965 study conducted by the U.S. Public Health Service (USPHS) in the vicinity of the Arsenal showed severe contamination of the aquifer below an area of at least 12 square miles. Contaminants observed included chloride, sodium, fluoride, arsenic, chlorate, the herbicide 2,4-D, and the insecticides aldrin and dieldrin. Chloride concentrations greater than 200 parts per million (ppm) were used as a contamination indicator. However, concentrations in the contaminated zone ranged as high as 3,000 to 4,000 ppm. The USPHS study also found that the saline water from the shallow contaminated zone in the vicinity of the Arsenal had probably entered an underlying bedrock aquifer through at least three defective wells in the vicinity of a previously used unlined holding pond. Extent of damage to that aquifer was not established.

As of 1975, groundwater contamination in the Rocky Mountain Arsenal area is still evident. A 1974-75 investigation conducted by the Colorado Department of Health detected aldrin ($\leq$30 ppb), endrin ($\leq$40 ppb), dieldrin ($\leq$40 ppb), and DCPD ($\leq$4 ppm) in the groundwater, migrating from the perimeter

of the 96-acre asphalt reservoir. The study defined the extent of groundwater contamination (based primarily on the distribution of DIMP) as approximately 30 square miles, of which 25 are outside the Arsenal property. The northernmost well indicating trace contamination from the Arsenal is located approximately one mile south of the public water supply well field of the City of Brighton.

In April 1975, the Colorado Department of Health issued a cease and desist order against the U.S. Army and Shell Chemical Company to stop polluting the surface- and ground-waters of the area. Since that time, the Army has entered into an extensive joint monitoring program with the Department of Health. In an effort to eliminate leakage from the perimeter of the asphalt-lined reservoir, the influent pipe has been extended to its center. Also, water which has surfaced in a slew area located 1.3 miles northeast of the reservoir has been pumped back to prevent its reaching the aquifer. Aerial photography is now being employed as an aid in determining the present extent and potential sources of contamination.

NOTE: Subsequent to the first printing of this report, it was learned that the Department of Defense is proposing to fund a comprehensive project to study the feasibility of decontaminating the Rocky Mountain Arsenal property. The project could cost as much as 78 million dollars over the next seven years. Based on the study's recommendations, a program will be initiated to restore the site.

HAZARDOUS WASTE DISPOSAL
DAMAGE REPORT

January 1976

Dumping into Sand Pit Pollutes Domestic Wells in Texas

1. Personal Damage - Offensive and irritating odors to nearby residents and motorists which according to witnesses caused nausea, sore throats, and headaches.

2. Environmental Damage - Contamination of ground- and surface-waters. Air pollution from occasional fires. Destruction of local vegetation.

3. Economic Damage - Discontinued use of about 26 wells for drinking water purposes for at least 1 1/2 years. Devaluation of property. Unknown amount spent by French Limited of Houston, Inc., on correction of pollution problem. Forced closure of nearby sand pit operation because waste seepage contaminated sand. Fires which occasionally caused closure of a highway.

4. Cause of Problem - Disposal of acidic and oily wastes into an unlined, abandoned sand pit.

5. Type and Quantity of Hazardous Waste - Approximately 70,000,000 gallons of solid, semi-solid, and liquid industrial wastes with a pH as low as 1.5 (highly acidic).

6. Source of Waste - Various oil refineries, petrochemical, chemical, and other industrial plants in the Houston metropolitan area.

7. Date of Incident - Waste disposal at the pit occurred from the mid-1960's to 1971. First complaints date back to 1966.

8. Location - Crosby (near Houston), Texas.

9. Status - The affected wells are again providing drinking water, and the disposal area no longer has odor problems. The Texas Highway Department is utilizing the site for disposal of excess dirt from a freeway project.

10. Remedial Action Taken - Prior to the summer of 1973, the company responsible for the disposal neutralized the acid wastes and skimmed the surficial oils. It pumped air into the waste pond and introduced bacteria cultures which lowered the COD. It also stabilized and rebuilt earthen dikes to prevent overflows.

11. Legal Action Taken - Litigation against French Limited of Houston, Inc., began on January 16, 1968, and was completed on October 31, 1973 (see Narrative).

12. Narrative*- The disposal of industrial wastes in an unlined sand pit in Crosby, Texas, resulted in the contamination of groundwater, surface waters, and the atmosphere. Disposal operations at the site began in the mid-1960's when the pit was owned and operated commercially by B.G. Burton. French Limited of Houston, Inc., a waste disposal company, purchased the pit from Mr. Burton in June 1967. Both Mr. Burton and French Limited accepted all types of industrial wastes from the Houston area. Approximately 70,000,000 gallons were poured into the sand pit.

Leachate from the pit, which was located above a 40-foot-thick sand aquifer, polluted the groundwater causing contamination of about 26 private wells in the area. Well water contaminants included abnormally high concentrations of Mn, Zn, Fe, and Cd, which originated from the dumping of steel mill pickling wastes into the pit. Failure of a dike permitted contamination to reach the San Jacinto River on several occasions.

Residents first complained of the pit operations to State government agencies in the summer of 1966. Seven years later, after numerous court actions, the site was closed. The highlights of these actions are:

°January 16, 1968--Courts temporarily enjoined French Limited from open burning and the disposal of liquid and oily wastes in an open pit. Operations continued.

°May 27, 1970--Violations of court order resulted in $2,000 fine. Operations continued.

°February 2, 1971-- Court judgment for five acts of contempt resulted in $500 fine. Operations continued.

°March 26, 1971--Court order cancelled the waste control permit of French Limited and ordered it to cease all discharges of waste and to remedy all problems existing at the site. Operations continued.

*The documentation for this Damage Report was obtained from the official records of Harris County and the Texas Water Quality Board.

°May 3, 1971--Temporary restraining order issued which prohibited further disposal of wastes. Operations ceased.

°May 3, 1971 - April 16, 1973--Series of eight court orders followed which outlined procedures to be taken in eliminating the pollution problems.

°June 15, 1973--Heavy flood flushed disposal site, removing most wastes into the San Jacinto River.

°October 31, 1973--Final court order issued which required French Limited to pay $5,000 to the County of Harris. In lieu of an additional cash payment, French Limited was to deed its 22-acre disposal site to the State of Texas.

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