Preliminary

Health Assessment for

PRELIMINARY HEALTH ASSESSMENT
HOOKER CHEMICAL & PLASTICS CORP
MUSKEGON COUNTY, MICHIGAN
MID006014906
March 1, 1989

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

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Prepared by:
Center for Environmental Health Sciences (CEHS)
Michigan Department of Public Health (MDPH)

Prepared for:
Office of Health Assessment
Agency for Toxic Substances and Disease Registry (ATSDR)

Background

The Hooker Chemical & Plastics Corp.(HCPC), a subsidiary of Occidental Petroleum Corporation, has been proposed for inclusion on the U.S. Environmental Protection Agency (U.S.EPA) National Priorities List (NPL). Negotiations are in process for site cleanup under authority of the Resource Conservation and Recovery Act (RCRA) program. HCPC occupies a 900-acre site, the southern portion of which borders on White Lake, a body of water contiguous with Lake Michigan. The HCPC facility is located on highly permeable surficial sands and glacial lake deposits. A leaky confining bed of glacial till and silty clay underlies the HCPC site. The top of the leaky confining bed, or aquitard, occurs at a depth of approximately 70 feet near the north end of the site and at approximately 120 feet at the south end of the property. Between 1954 and 1981, HCPC is reported to have disposed of more than 21 million cubic feet of organic, inorganic, heavy metal and acid wastes on site. Until 1977, HCPC manufactured hexachlorocyclopentadiene (C-56), a chemical intermediate used in the manufacture of pesticides and fire retardants. A number of other chlorinated hydrocarbons were created as a result of the C-56 production. All manufacturing activities ceased at the site in 1982.

Contamination of soil, surface water, groundwater, and air has occurred due to the improper disposal of chlorinated hydrocarbons and brine sludges on-site. Contaminated groundwater has migrated off-site in a southerly direction, contaminating nearby private wells and flowing south into White Lake.

Subsequent to provisions and terms agreed to by Occidental Petroleum Corporation and the State of Michigan, a Consent Judgment was issued in 1979. Under the judgment, 1.3 million cubic yards of contaminated soils were excavated and deposited in a clay-lined, clay-capped vault, in the shape of a truncated pyramid, constructed on-site. The entire above-ground clay surfaces of this structure are covered with cultivated groundcover vegetation irrigated during the summer months. Thisprecautionary action helps prevent excessive drying of the clay that might cause cracking. The C-56 production facility was also dismantled and placed into the vault. An array of groundwater purge wells and an activated carbon treatment system have been installed and are currently maintained and operated by HCPC. The objective of the purge system is to capture and cleanse contaminated groundwater before it reaches White Lake.

Under a current National Pollution Discharge Elimination System (NPDES) permit, groundwater which is treated on-site and then directly discharged into White Lake, is authorized to contain contaminants at the following maximum concentrations in parts per billion (ppb): carbon tetrachloride, 1.0; chloroform 1.0; trichloroethylene (TCE), 1.0; perchloroethylene (PCE), 1.0; hexachlorobutadiene (C-46), 0.05; C-56, 1.0; octachlorocyclopentene (C-58), 1.0; hexachlorobenzene (C-66), 0.2; and mirex, 1.0.

The City of Montague adjoins the eastern boundary of the HCPC facility. Approximately 40 residences within the municipality currently utilize private wells. The nearest residential well is located approximately 650 feet east of HCPC. All residences with private wells contaminated by the HCPC groundwater plume been connected to the City of Montague water supply.

The City of Montague obtains its water supply from three production wells, the nearest one of which is located approximately 1-1/4 miles northeast of HCPC. Each of these wells taps an aquifer situated beneath an apparently impermeable confining layer of clay. The city formerly had four production wells, but one, located approximately 3/4 of a mile east of the HCPC site, was abandoned at an unspecified date due to PCE and TCE contamination. The source(s) of these hydrocarbon pollutants has/ have never been determined. The abandoned well drew from a shallower depth than the three current production wells.

In May of 1985, the State of Michigan brought suit against Occidental Petroleum Corporation for two reasons. First, the State contended that the number of purge wells and their pumping rate were insufficient to halt the flow of contaminated groundwater to White Lake. The court concurred with the State and HCPC has since upgraded the purge well system. The Michigan Department of Natural Resources (MDNR) is currently evaluating the efficacy of the increased extraction rate. Secondly, an on-site area known as "no man's land" currently contains approximately 80,000 cubic yards of C-56 contaminated soil. The State and Occidental Petroleum are negotiating a response to this contamination. The parties are reviewing the 1979 Consent Judgment to determine if it was also intended to provide for the cleanup and disposal of the "no man's land" contamination.

The site on which the clay vault is located is enclosed by a fence and security personnel guard the area 24 hours per day. The administration, manufacturing and storage areas, and former on-site landfills have also been fenced.

Environmental Contamination and Physical Hazards

Since the late 1970s, contamination has been consistently observed in groundwater samples taken from on-site wells located downgradient from known current or former foci of on-site chemical contamination. Samples collected monthly during December 1985 through February 1986 from six different on-site wells, showed the following maximum contaminant concentrations in ppb: carbon tetrachloride, 10,230; TCE, 326; PCE, 21,880; chloroform, 981; C-46, 3.7; C-56, 0.3. An upgradient on-site monitor well sampled during the same time frame was not found to contain any of the aforementioned compounds.

The efficacy of on-site purge wells remains to be determined. While hydrogeologic testing shows that the purge wells effectively reverse the direction of flow of the water table (the groundwater surface), there is uncertainty whether or not lower levels of the aquifer also exhibit a reversal of flow.

The MDNR has analyzed water samples taken 30-300 feet offshore from the point where the HCPC contaminant plume would enter White Lake, if it were not intercepted by the purge well system. Samples analyzed in 1987 showed that the average concentration of low boilers (compounds which adsorb out of a solution at relatively low boiling points) such as carbon tetrachloride, chloroform, TCE and PCE is substantially reduced compared to earlier years. The average concentration of these low boilers in the 1987 samples was 3 ppb, with a maximum of 7 ppb. The average concentration of low boilers for the three previous years was 11.3 ppb, with an average maximum of 58.7 ppb. These samples did not contain any high boilers (i.e., C-46, C-56, C-58, C-66) exceeding HCPC's NPDES permit levels.

Analysis of White Lake fish in 1979 revealed mirex in 9 out of a collection of 12 fish at levels ranging from 0.001 ppm (parts per million) to 0.031 ppm. HCB was found in 4 of the 12 fish at levels ranging from 0.002 to 0.014 ppm.

At least one area of soil contamination remains. In 1983, MDNR personnel discovered an area of soil contamination adjacent to the site of the former C-56 production facility. This area has been named "no man's land." Six soil samples were taken from this area June 24, 1983 and four chemicals with the following maximum concentrations were found: C-46, 570,000 ppb; C-56, 3,900,000 ppb; C-58, 1,800,000 ppb; and C-66, 1,100,000 ppb. No specific action has been taken concerning this contamination although, as stated above, regulatory agencies and HCPC are discussing the issue. In 1983, unquantified heavy odors and noxious vapor clouds were reported by MDNR personnel to be emanating from "no man's land."

Potential Environmental and Human Exposure Pathways

Although a major clean-up of contaminants followed the 1979 Consent Agreement between Occidental Petroleum Corporation and the State of Michigan, environmental and human exposure to site-generated contaminants may continue to occur.

Groundwater contaminants are known to have migrated off-site, affecting private wells south of HCPC. As stated above, all residences affected have been connected to the City of Montague water supply. Proper closing of contaminated wells and restriction against installation of new wells within the contaminated plume should be assured in order to eliminate human exposures from occurring in the future.

Hydrogeologic data demonstrate that the contaminant plume discharges into White Lake. On-site groundwater extraction and activated carbon treatment of plume contaminants have been operational since 1979. The extraction capacity of the purge system has been increased in recent years although unacceptable levels of chlorinated hydrocarbons were still reaching White Lake prior to 1987.

Water samples taken from White Lake in 1978, both near-shore and at varying depths off-shore, showed concentrations of carbon tetrachloride as high as 40 ppb, and of dichloroethylene as high as 80 ppb. White Lake was sampled in 1987 and found to contain reduced levels of low boilers. Periodic testing is needed to confirm the effectiveness of the purge system in protecting against unacceptable levels of contaminants reaching White Lake.

As a consequence of the previous contamination of White Lake dermal contact and consumption of White Lake fish have been evaluated. As mentioned earlier, a 1979 investigation of White Lake fish

found Mirex levels ranging from 0.001 to 0.031 ppb in 9 out of 12 fish, and HCB levels ranging from .002 to 0.014 ppm in 4 out of 12 fish. The Food and Drug Administration (FDA) action level for Mirex in regard to commercial sale of fish is 0.1 ppm. This value is nearly 10 times higher than the average concentration of the 12 fish. An upper limit for human consumption of 0.6 ug/kg/day was proposed by Food and Agricultural Organization/ World Health Organization. Assuming the average human consumption of fish to be 11 lb/yr and that the average adult body weight is 70 kg., an individual would consume only 0.0027 ug/kg/day from eating fish containing the highest level of HCB found in the most recent fish collection. The FDA has not, as yet, proposed an action level for HCB in fish. However, for cattle, sheep, and goat fat a 0.3 ppm standard has been set. This action level is still 20 times higher than the highest concentration (0.014 ppm) of HCB found in the White Lake fish.
Residents living in the vicinity of the HCPC may have been exposed to volatilized hydrocarbons. The potential for off-site exposures to significant levels of contaminants through volatilization has been greatly reduced by subsequent remedial measures.

Based on the best available information, all contaminated material from the site has been collected and placed in the on-site containment vault. However, thousands of cubic feet of uncharacterized contaminated soil still remain in the area referred to as ''no man's land''. Because the site is fenced, guarded and posted, unauthorized access to contaminated soils is minimal.

Demographics

An EPA Potential Hazardous Waste Site Preliminary Assessment of HCPC, dated March 15, 1983, indicates that at the time of that assessment approximately 500, 3,000 and 7,000 people lived within a radius of one, two and three miles from the facility, respectively. The site is located approximately one mile southwest of a densely populated urban area, including the cities of Montague and Whitehall. In the immediate vicinity, there are a number of residences; the areas to the south, along White Lake, to the east, southeast and north are all residential. The Manistee National forest lies one and a half miles north of the HCPC site.

Evaluation and Discussion

Because of the tremendous quantity of contaminants situated on-site, the clay vault and the purge well system must be closely monitored.

A full assessment of the public health implications of this site cannot be made without a full characterization of the area known as ''no man's land.''

Recommendations and Conclusions

This site is of potential public health concern because of the risk to human health that could result from possible exposure to hazardous substances at levels that may result in adverse health effects over time. As noted in **Environmental Contamination and Physical Hazards** and **Potential Environmental and Human Exposure Pathways** sections, human exposure to carbon tetrachloride, trichloroethylene, perchloroethylene, chloroform, hexachlorobutadiene, hexachlorocyclopentadiene, octachlorocyclopentene, and hexachlorobenzene may have occurred in the past via direct ingestion, dermal contact and possibly inhalation.

It is recommended that "no man's land" be fully characterized in order that a complete and comprehensive evaluation of public health implications can be made.

In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended, the Hooker Chemical & Plastics Corp site has been evaluated for appropriate follow up with respect to health effects studies. Although there are indications that human exposure to on-site/off-site contaminants has previously occurred, this site is not being considered for follow-up health studies at this time because the size of the population likely exposed to significant contaminant levels was inadequate to allow statistically valid conclusions for the study.

Sources

Consent Judgment, State of Michigan and Hooker Chemical & Plastics Corporation, Ingham County Circuit Court, October 30, 1979.

MDNR, Letter to U.S. EPA., May 10, 1985

MDNR, Telephone communication, September 27-28, 1988

Montague Department of Public Works, Thomas Kroll, Telephone communication, September 14, 1988

Occidental Chemical monthly Operating Reports: December 1985, January 1986 and February 1986.

Occidental Petroleum Corporation, John Nichter, Telephone communication, July 5, 1988

United States Department of Agriculture. October 1968. Soil Survey of Muskegon County, Michigan

U.S. EPA Letter to Michigan Department of Commerce. March 26, 1987

U.S. EPA Potential Hazardous Waste Site Preliminary Assessment. March 15, 1983

U.S. EPA Douglas Ballotti, Telephone communication, September 26, 1988

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THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104(i)(7)(A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risk assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, ATSDR has conducted this preliminary health assessment on the data in site summary form. Additional health assessments may be conducted for this site as more information becomes available to ATSDR.

Introduction

An ATSDR Health Assessment is an evaluation of data and information on the release of hazardous substances into the environment. These assessments, one for each of the National Priorities List toxic waste sites, have been mandated by the Superfund law in order to accomplish several objectives. Among these objectives are: 1.) To assess any current or future impacts on public health, 2.) To develop health advisories or other health recommendations and 3.) To identify actions, including studies, that are needed to either mitigate and evaluate human health effects, or to prevent them from occurring.

A health assessment for a facility or a particular release of substances consists of the evaluation and interpretation of available information and analytical data. The process is iterative, that is, the assessment constantly builds upon existing material and is subject to change as more information and data become available. The assessment process does not wait for completion of all possible studies relevant to a site but instead builds a report based on the best available information from all relevant sources and distributes it in a timely manner.

New information provided by the public following their review of this document will be taken into consideration during preparation of any subsequent updated assessments for the site. Such information can be sent to:

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