

Health Consultation

CLOVER CREEK WORKERS

(a/k/a VELSICOL CHEMICAL CORP.)

TOONE, HARDEMAN COUNTY, TENNESSEE

EPA FACILITY ID: TND980559033

JULY 12, 2006

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared by:

Tennessee Department of Health
Under a Cooperative Agreement with the
The Agency for Toxic Substances and Disease Registry

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Introduction

In February 2006, the Jackson District of the U.S. Department of Agriculture's (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) agency, with concerns about worker exposure to chemical contamination in Clover Creek, contacted the Tennessee Department of Health, Environmental Epidemiology (TDH-EEP), for assistance. The TDH-EEP was asked to evaluate any potential health effects that could result from the occupational exposure of USDA-APHIS/WS workers to the contaminated creek water.

The USDA-APHIS/WS serves the citizens of Tennessee by helping to protect agriculture, human health and safety, natural resources, and property from damage or threats posed by wildlife. One of the jobs performed by the USDA-APHIS/WS personnel is the removal of beaver dams. Dams built by beavers can lead to flooding. USDA-APHIS/WS personnel sometimes use explosives for dam removal. However, the most common tactic is for workers to simply wade into a waterway and physically dismantle the beaver dam by hand.

The USDA-APHIS/WS personnel conduct beaver dam removal work in many parts of western Tennessee and occasionally in Clover Creek. Pugh Creek is a small tributary to Clover Creek. Pugh Creek flows adjacent to a U.S. Environmental Protection Agency (EPA), Superfund National Priorities List (NPL) site, known as the Velsicol Chemical Corporation Landfill (Figure 1), located in Toone, Hardeman County, Tennessee. Chemicals identified as being present in the landfill have been found in Pugh Creek and in Clover Creek. Of the contaminants identified, carbon tetrachloride has been the main concern, due to its toxicity to humans. Therefore, this public health consultation will focus on USDA-APHIS/WS worker contact with the waters of Clover Creek contaminated with carbon tetrachloride (see Appendix C).

Background

Landfill

The Velsicol Chemical Corporation Landfill (VCCL) site is located approximately 1½ miles north of Tennessee State Route 100 (a.k.a., Highway 100) on Old Toone Road, in northeastern Hardeman County (Figure 1). The VCCL consists of a 242-acre parcel of land that was owned by the Velsicol Corporation at the time of the hazardous waste disposal. The portions of the property actually used for waste disposal occupy approximately 27 acres located on the higher elevations of the VCCL property. The landfill was used for disposal of pesticides and volatile organic compounds (VOCs) from 1964 to 1973. The Velsicol plant in Memphis, Tennessee, generated the waste materials. Approximately 130,000 drums of chemical waste were disposed of in the landfill (EPA 2006a).

The landfill site was added to the EPA Superfund NPL listing of hazardous waste sites in urgent need of cleanup in September 1983 (EPA Site ID# TND980559033). Investigations of the site have found that an estimated 3.6 million cubic yards of soils underlying the wastes were contaminated. The depth of contamination was found at 60 to 70 feet below the base of the

wastes. Private water wells in the vicinity were impacted by groundwater contamination, mainly from chloroform and carbon tetrachloride, which have been attributed to the site (EPA 2006a).

In addition to groundwater contamination, surface waters in the vicinity of the landfill were also impacted by chemical contamination. The presence of carbon tetrachloride has been confirmed in laboratory analysis of surface water samples taken from Pugh Creek and Clover Creek (EIC 2005).

Surface Streams

Figure 2 shows the VCCL and the surrounding vicinity. Contaminated groundwater believed to have migrated from the VCCL, has impacted the four streams nearest to the landfill. They are Clover Creek, Pugh Creek, and two unnamed streams. Pugh Creek and the two unnamed streams are tributaries to Clover Creek.

Pugh Creek flows along the eastern side of the landfill site and then past the landfill northward to its intersection with Clover Creek. Clover Creek flows from east to west, across the northern portion of Hardeman County, to the Hatchie River. One of the unnamed streams, beginning near the southwest corner of the VCCL, flows north-northwest to Clover Creek. The smaller unnamed stream originates from near the northwest corner of the VCCL and flows northwest until it intersects Clover Creek.

Of the four streams located closest to the VCCL, Clover Creek is the only creek that is known to have water flow throughout the year (i.e., a perennial stream). Clover Creek occupies a broad floodplain where large wetland areas often obscure the main creek channel. Pugh Creek, and the two unnamed streams are intermittent streams. Intermittent streams generally sustain water flow for only a portion of the year. In Tennessee, this would typically be during the winter and spring months of the year (EIC 2005).

Recent Site Investigation

After cleanup activities have been conducted at a Superfund site, the EPA requires the site to undergo periodic reviews, known as five-year reviews, to assess the effectiveness of the cleanup methods utilized. To provide data for the second five-year review of this site, the EPA directed the current ownership entity of the VCCL (i.e., the Custodial Trust), in an August 2004 letter to prepare and submit a site sampling work plan. ENVIRON International Corporation (EIC), working on behalf of the Custodial Trust, prepared and submitted the work plan. EPA subsequently approved the plan and EIC began the environmental sampling work at the VCCL site in December 2004 (EIC 2005).

In July 2005, EIC submitted the results of their sediment and surface water investigation to the EPA and the Tennessee Department of Environment and Conservation (TDEC). The EIC report about this investigation included laboratory data results from the sediment and water sampling of the streams surrounding the VCCL. Thus, the laboratory data utilized in this public health consultation is recent, and considered to be representative of the current water quality conditions found in the streams in the VCCL vicinity.

Discussion

Chemical Contamination of Clover Creek

VCCL is believed to be the source of the carbon tetrachloride detected in the four streams (EIC 2005). The VCCL site is located atop a ridge situated between the headwaters of Pugh Creek and the headwaters of the unnamed stream that comprises the western boundary of the EIC sampling area (Figure 2). The contaminated groundwater from the topographically elevated landfill area moves generally toward the stream valleys surrounding the site. Due to its proximity to the landfill, water in Pugh Creek and its associated groundwater seeps, tends to exhibit higher concentrations of carbon tetrachloride. Since Pugh Creek and the unnamed streams are tributaries to Clover Creek, they transport the carbon tetrachloride contamination to it.

Table 1 shows the carbon tetrachloride concentrations in the surface water (stream or seep) around the VCCL at the locations sampled (Figure 2) during the sediment and surface water investigation performed by EIC (2005).

TABLE 1. Carbon Tetrachloride concentrations from the surface waters in the vicinity of the Velsicol Chemical Corporation Landfill as presented in the July 2005 ENVIRON International Corporation report. The EIC sampling point locations are shown in Figure 2, and the carbon tetrachloride concentration results are reported in parts per billion (ppb).			
Sampling Point Location ~ Stream/Seep	Carbon Tetrachloride concentration	Sampling Point Location ~ Stream/Seep	Carbon Tetrachloride concentration
S1 ~ Pugh Creek; BKG	U	S15 ~ Seep	20
S2 ~ Pugh Creek	U	S16 ~ Clover Creek	U
S3 ~ Pugh Creek	110	S17 ~ Clover Creek	2.9
S4 ~ Pugh Creek	59	S18 ~ Seep	U
S5 ~ Seep	22	S19 ~ Seep	U
S6 ~ Seep	820	S20 ~ unnamed stream	180
S7 ~ Pugh Creek	100	S21 ~ unnamed stream	4.6
S8 ~ Pugh Creek	91	S22 ~ Clover Creek	U
S9 ~ Pugh Creek	110	S23 ~ Clover Creek	U
S10 ~ Clover Creek; BKG	U	S24 ~ Seep	1.0
S11 ~ Clover Creek; BKG	U	S25 ~ Seep	160
S12 ~ Clover Creek	U	S26 ~ Seep	190
S13 ~ Seep	U	S27 ~ Seep	6100
S14 ~ Clover Creek	24		

BKG = background sample; taken in an area not suspected to contain VCCL related contaminants.
 U = Undetected (i.e., constituent was either not present or at levels below the analytical detection limit)
BOLD = sampling points and chemical concentrations pertaining to Clover Creek.

Based upon the July 2005 data presented in Table 1, the portion of Clover Creek contaminated with carbon tetrachloride appears to be confined to the segment of the stream located between the eastern crossing of Teague Road over Clover Creek and water sampling location S22 (Figure 2). This segment of Clover Creek, starting at the bridge over Clover Creek, just north of the Teague Community to sample location S22, is approximately 2.5 miles in length. Approximately 1.5 miles of this 2.5-mile segment, corresponds to the portion of the Clover Creek that comprises the western boundary of the EIC sediment and surface water investigation.

Background water samples taken at locations S10 and S11, upstream of the eastern Teague Road bridge over Clover Creek, did not detect carbon tetrachloride in the stream. Carbon tetrachloride was detected, as would be expected, after the waters of Pugh Creek entered Clover Creek. Sample locations, S14, S15, and S17 confirmed the presence of carbon tetrachloride in Clover Creek. However, by the time the waters of Clover Creek reached sample locations S22 and S23 (Figure 2), it was not detected. Due to its chemical properties (i.e., carbon tetrachloride is highly volatile), the relatively low concentration of carbon tetrachloride volatilized and dissipated from the water.

Introduction to Chemical Exposure

To determine whether persons are, have been, or are likely to be exposed to chemicals, Environmental Epidemiology of the Tennessee Department of Health evaluates mechanisms that could lead to human exposure. An exposure pathway contains five parts:

- a source of contamination
- contaminant transport through an environmental medium,
- a point of exposure
- a route of human exposure, and
- a receptor population

An exposure pathway is considered complete if there is evidence that all five of these elements are, have been, or will be present at the site. The pathway is considered either a potential or an incomplete exposure pathway if there is no evidence that at least one of the five elements listed is, has been, or will be present at the site, or if there is a lower probability of exposure.

When a chemical is released from an area such as an industrial plant or from a container such as a drum, it enters the environment. A chemical release does not, however, always lead to human exposure. Persons can be exposed to a chemical when contact is made by breathing, eating, drinking, or otherwise touching the chemical.

Furthermore, physical contact alone with a potentially harmful chemical in the environment by itself does not necessarily mean that a person will develop adverse health effects. A chemical's ability to affect public health is controlled by a number of other factors, including:

- the amount of the chemical that a person is exposed to (dose)

- the length of time that a person is exposed to the chemical (duration)
- the number of times a person is exposed to the chemical (frequency)
- the person's age and health status
- the person's diet and nutritional habits.

TDH-EEP evaluated the potential for human exposure to carbon tetrachloride in the stream water. We examined the pathway by which USDA-APHIS/WS personnel could come in contact with carbon tetrachloride. We then compared the environmental levels of carbon tetrachloride to health screening values established by the Agency for Toxic Substances and Disease Registry (ATSDR) to determine if further evaluation was needed.

Exposure Pathways

A completed exposure pathway exists in the contaminated segment of Clover Creek, located immediately north of the VCCL, for USDA-APHIS/WS workers. Carbon tetrachloride present in this segment of Clover Creek could potentially be a dermal contact hazard and volatilized in the air could potentially be an inhalation hazard.

Carbon Tetrachloride Exposure

While working in a creek (i.e., any surface stream), USDA-APHIS/WS personnel wear rubberized hip or chest waders. Also, they will wear rubber gloves during the fall and winter months (i.e., October – April). Thus, during the summer months the workers will typically conduct beaver dam removal operations barehanded. Though this method of operation would constitute an opportunity for dermal exposure to carbon tetrachloride laden creek water, the amount of time these workers would spend in the contaminated segment of Clover Creek is minimal (i.e., minimal duration and frequency of exposure).

To look more closely at the people who might be exposed to a hazardous substance, health assessors use health-screening levels related to specific chemicals. To use these screening levels we must know how much of a chemical someone is exposed to, for how long that exposure has been or will be occurring, how frequent the exposure is or will be, and age of the exposed person. If concentrations are below the screening level for a particular chemical, health assessors can be reasonably certain that no adverse health effects will occur in people who are exposed. If concentrations are above the screening levels for a particular chemical, then the public health implications need to be evaluated further.

Evaluating Non-cancer Risk

For non-carcinogenic effects of hazardous chemicals, ATSDR derives a minimal risk level (MRL) for each chemical. From the MRLs, ATSDR has derived health guidance values, often called Environmental Media Evaluation Guides (EMEGs) for soil, air, and water.

At this time there are no MRLs/EMEGs for dermal exposure to carbon tetrachloride. ATSDR documentation states that dermal contact with carbon tetrachloride by humans has not been shown to be a significant route of exposure for this chemical (ATSDR 2005b). Thus, we can use this analogy to reasonably rule out any significant dermal exposure to carbon tetrachloride that USDA-APHIS/WS workers would experience with their occasional bare-skin contact with the waters of the contaminated segment of Clover Creek.

In this case, inhalation appears to be the more significant route of exposure for carbon tetrachloride (ATSDR 2005b). Therefore, we have used the ATSDR EMEGs for air as a starting place in determining if health hazards may exist for USDA-APHIS/WS personnel working in contaminated segment of Clover Creek. To examine the inhalation route of exposure, we used the ATSDR EMEGs because they are based on the MRLs, and are conservative assumptions about chemical exposure. EMEGs apply to acute (14 days or less), intermediate (15–365 days) and chronic (365 days or more) exposures. In the case of carbon tetrachloride, the EMEG and MRL values (or concentrations) for the inhalation exposure are the same. The EMEG/MRL concentration for carbon tetrachloride is 30 ppb for intermediate inhalation exposure, and 30 ppb for chronic inhalation exposure (ATSDR 2005a).

The EIC report submitted to EPA and TDEC contains a comprehensive human risk evaluation. In this risk evaluation, the potential for inhalation exposure to carbon tetrachloride by people that come into close proximity to contaminated waters of the streams around the VCCL was examined. EIC, utilizing mathematical models, calculated estimates of ambient air concentrations of carbon tetrachloride for the streams in the study area based the on the highest concentrations of carbon tetrachloride found in the water. For the segment of Clover Creek containing carbon tetrachloride, the ambient air concentration was estimated to be 0.22 ppb (EIC 2005).

When compared to the EMEG for carbon tetrachloride in air (30 ppb), the estimated ambient air concentration is over 100 times lower than the intermediate and chronic inhalation exposure level of 30 ppb. Thus, based upon the data and information presented, non-carcinogenic adverse health effects would not be anticipated for any USDA-APHIS/WS employees working in, or near, the contaminated segment of Clover Creek.

Evaluating Cancer Risk

For evaluating potential carcinogenic effects of hazardous chemicals, ATSDR has derived a comparison value similar to the MRL and EMEG. This comparison value is called the Cancer Risk Evaluation Guide (CREG). The CREG is the estimated contaminant concentration that would be expected to cause no more than one excess cancer in one million (1×10^{-6}) persons exposed over a lifetime (70 years). CREG values are calculated using the EPA cancer slope factors.

The CREG for the inhalation exposure to carbon tetrachloride is 0.01 ppb. Though the estimated ambient air concentration of 0.22 ppb carbon tetrachloride for Clover Creek is higher than the CREG screening value, it is important to understand that these screening values are for an exposure period of a human lifetime (assuming 24 hour exposure, 7 days/week, 52 weeks/year for 70 years).

The duration and frequency of exposure USDA-APHIS/WS workers removing the occasional beaver dam from the contaminated segment of Clover Creek is minimal. Assuming USDA-APHIS/WS personnel worked in the contaminated segment of Clover Creek, one full 8-hour workday each month for one year, the duration of exposure to the estimated carbon tetrachloride concentration of 0.22 ppb would equal 96 hours (4 days). If a USDA-APHIS/WS employee remained on the job for a career spanning 30 years, the resulting time of exposure would be 120 days. If the same employee removed a beaver dam once a week for the same career duration, a total of 519 days could potentially be spent in the contaminated segment of Clover Creek. A person 70 years of age has lived 25,550 days.

Another aspect of inhalation exposure to carbon tetrachloride is the amount of the chemical that is already in the environment, or background level. Carbon tetrachloride is ubiquitous in ambient air. The average concentration reported in the National Ambient Volatile Organic Compounds Database updated in 1988 was 0.17 ppb. Average values reported in four U.S. cities ranged from 0.14 to 0.29 ppb. Average concentrations reported from five coastal monitoring stations around the world were 0.10 to 0.13 ppb. Carbon tetrachloride is also commonly detected in indoor air. For 2,120 indoor air samples in the United States, the average concentration was 0.40 ppb (ATSDR 2005b).

TDH-EEP calculated exposure doses for five exposure scenarios to see how worker exposure in Clover Creek would compare to exposure to background and indoor air concentrations of carbon tetrachloride. The dose calculation results are presented in Appendix B. A USDA-APHIS/WS 30-year career employee working one day a week in the contaminated segment of Clover Creek, would receive a calculated dose 4 times lower than the dose received from background levels over the course of a lifetime. However, based upon the current EIC data and conservative assumptions regarding the frequency and duration of exposure at this site, the likelihood of excess cancers resulting from carbon tetrachloride inhalation would not be anticipated for USDA-APHIS/WS employees working in, or near, the contaminated segment of Clover Creek.

Children's Health Considerations

In the preparation of this health document, the health of children was thoughtfully considered, because children could be at greater risk than adults from certain kinds of exposure to hazardous substances (ATSDR 1997, 1998). However, only adults are employed by the USDA-APHIS/WS, and no children are anticipated to be present at USDA-APHIS/WS work locations. In regard to the carbon tetrachloride contaminated segment of Clover Creek, no health threats unique to children were identified during this investigation.

Conclusions

Based on the data provided by the ENVIRON International Corporation (EIC 2005), no apparent health hazard exists for the USDA-APHIS/WS employees from the carbon tetrachloride concentrations found in the contaminated segment of Clover Creek, located to the north of the Velsicol Chemical Corporation Landfill (EPA ID# TND980559033), Toone, Hardeman County, Tennessee.

Recommendations

The U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (USDA-APHIS/WS) Jackson District manager should periodically contact the EPA Region 4, Project Manager for the Velsicol Chemical Corporation Landfill (VCCL) site to keep abreast of site conditions and whether are any significant changes in the carbon tetrachloride levels in the streams around the landfill site, from those presented in this document.

Public Health Action Plan

1. Tennessee Department of Health, Environmental Epidemiology (TDH-EEP) will provide copies of this public health consultation to the USDA-APHIS/WS Jackson District manager, any concerned local residents, TWRA Region 1 office in Jackson, and the TDEC Jackson Field Office WPC Manager.
2. TDH-EEP will continue to provide health education to environmental regulatory agencies and community members concerned about the site.
3. TDH-EEP will continue to work with the USDA-APHIS/WS as needed, and is available to review additional data.

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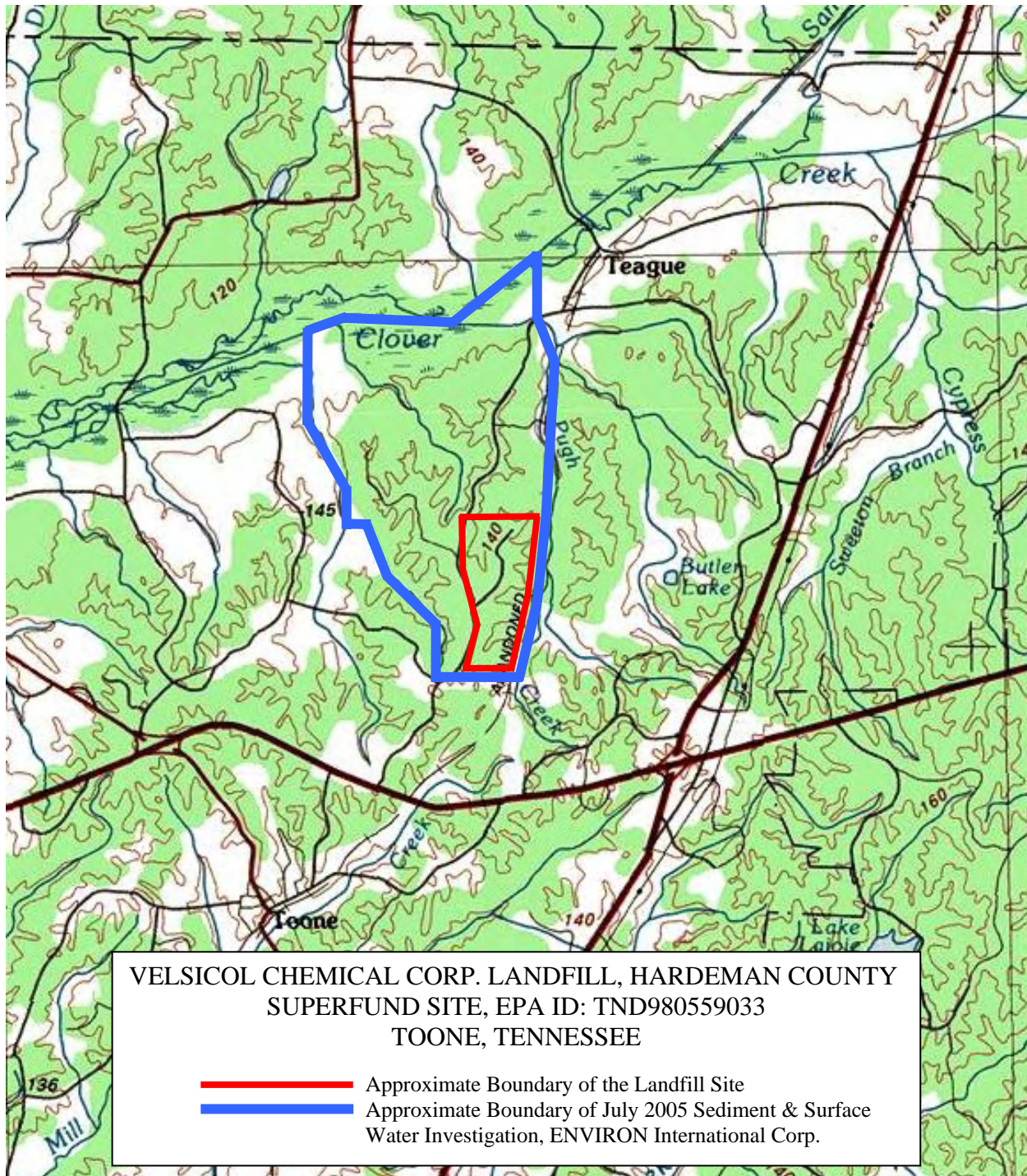
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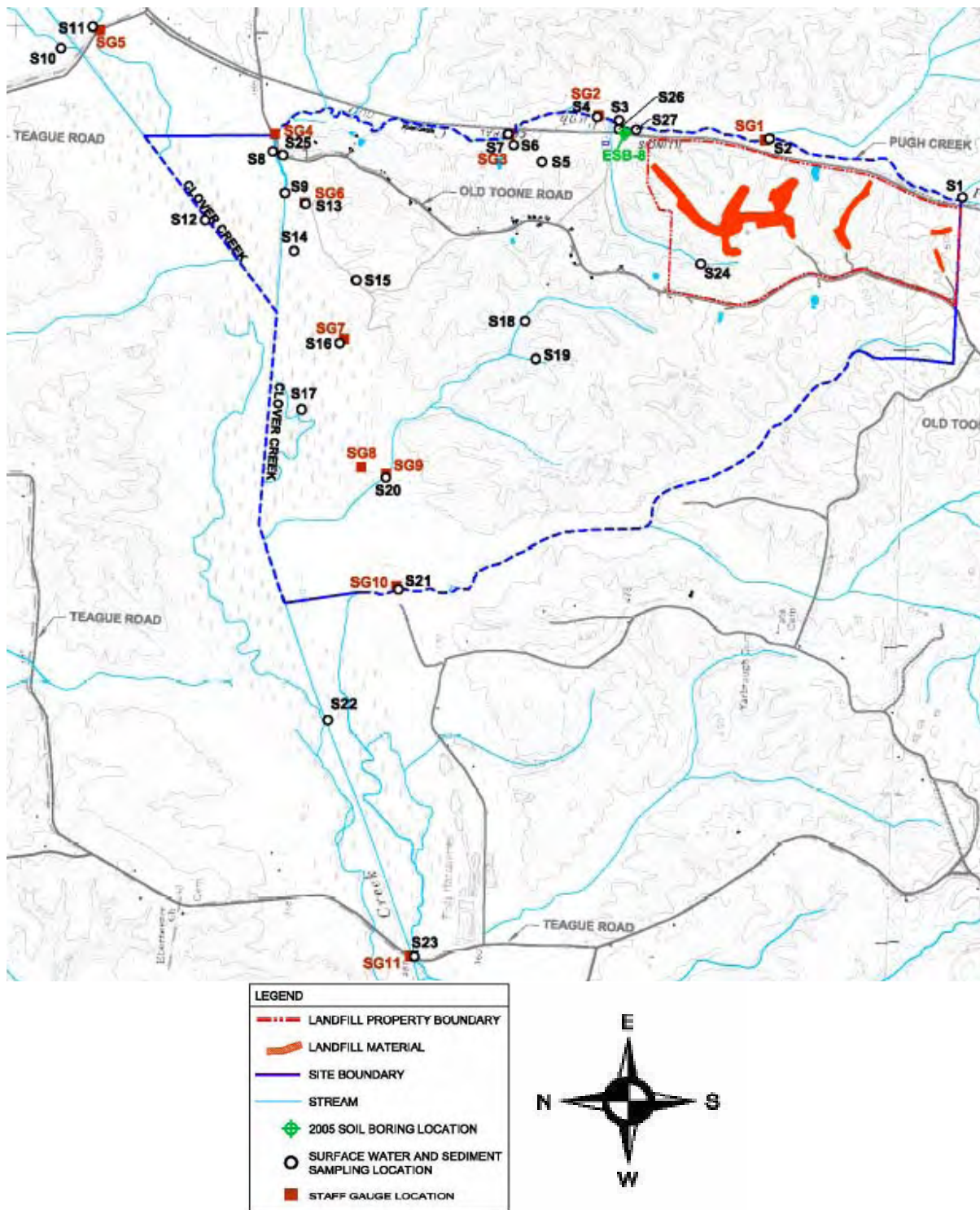
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FIGURE 1 - Site location map. Clover Creek in the vicinity of the Hardeman County Landfill.



(Map credit: National Geographic Society, TOPO!)

FIGURE 2 - Velsicol Chemical Corporation, Hardeman County Landfill, Sediment and Surface Water Investigation, July 2005. Map showing environmental sampling locations (Note alternative map orientation). Toone, Hardeman County, Tennessee.



(Map credit: ENVIRON International Corporation)

APPENDIX A

Carbon Tetrachloride, CCl₄

Carbon tetrachloride is a clear liquid that evaporates very easily. Most carbon tetrachloride that escapes to the environment is therefore found as a gas. Carbon tetrachloride does not easily burn. Carbon tetrachloride has a sweet odor, and most people can begin to smell it in air when the concentration reaches 10,000 parts carbon tetrachloride per billion parts of air (ppb). It is not known whether people can taste it or, if they can, at what level.

Carbon tetrachloride does not occur naturally but has been produced in large quantities to make refrigeration fluid and propellants for aerosol cans. Since many refrigerants and aerosol propellants have been found to affect the earth's ozone layer, the production of these chemicals is being phased out.

Carbon tetrachloride concentrations in air, ranging from 0.1 to 0.16 parts per billion (ppb) is common in the United States (ATSDR 2005b). Once carbon tetrachloride is in the troposphere, it is a stable gaseous compound. Due to the lack of rapid tropospheric removal mechanisms, carbon tetrachloride accumulates in the lower atmosphere and has an estimated atmospheric lifetime of 50 years. Thus, the most common source of exposure to ambient carbon tetrachloride is from the background concentration.

Most information on the health effects of carbon tetrachloride in humans comes from cases where people have been exposed to relatively high levels of carbon tetrachloride, either only once or for a short period of time. Experiments have not been performed on the effects of long-term exposure of humans to low levels of carbon tetrachloride, so the human health effects of such exposures are not known.

The liver is especially sensitive to carbon tetrachloride. In mild cases, the liver becomes swollen and tender, and fat builds up inside the organ. In severe cases, liver cells may be damaged or destroyed, leading to a decrease in liver function. Such effects are usually reversible if exposure is not too high or too long. The kidney is also sensitive to carbon tetrachloride. Less urine may be formed, leading to a buildup of water in the body (especially in the lungs) and buildup of waste products in the blood. Kidney failure often was the main cause of death in people after very high exposure to carbon tetrachloride (ATSDR 2005b).

After exposure to high levels of carbon tetrachloride, the nervous system, including the brain, is affected. Such exposure can be fatal. The immediate effects are usually signs of intoxication, including headache, dizziness, and sleepiness perhaps accompanied by nausea and vomiting. These effects usually disappear within a day or two after exposure stops. In severe cases, stupor or even coma can result, and permanent damage to nerve cells can occur.

Many reported cases of carbon tetrachloride toxicity are associated with drinking alcohol. The frequent consumption of alcoholic beverages increases the danger from carbon tetrachloride exposure (ATSDR 2005b).

Studies in animals have shown that the ingestion of carbon tetrachloride can increase the frequency of liver tumors in some species. Studies have not been performed to determine if breathing carbon tetrachloride causes tumors in animals, or whether swallowing or breathing carbon tetrachloride causes tumors in humans, but it should be assumed that carbon tetrachloride could produce cancer. The Department of Health and Human Services (DHHS) has determined that carbon tetrachloride may reasonably be anticipated to be a carcinogen. The International Agency for Research on Cancer (IARC) has determined that carbon tetrachloride is possibly carcinogenic to humans. The EPA has determined that carbon tetrachloride is a probable human carcinogen. EPA has derived an Inhalation Unit Risk of an excess risk of cancer of 1.5×10^{-5} . This means that 1 excess cancer in one million people may occur if people are exposed to 0.01 ppb carbon tetrachloride over a lifetime.

It is important to note that there are no data on exposure of humans to low levels of carbon tetrachloride nor is there useful experimental data in animals on adverse effects from inhalation of carbon tetrachloride.

APPENDIX B

Dose Calculations

Five exposure scenarios were examined to compare the potential dose of carbon tetrachloride a USDA-APHIS/WS worker may receive. Dose results are reported in milligrams per kilogram per day (mg/kg/day). The doses are calculated utilizing the standard ATSDR default values for adults (ATSDR 2005c).

The ATSDR default values are:

- An adult is assumed to weigh 70 kg (154 pounds).
- Inhaling 15.2 m³/day of air per day (adult male 19-65+ years of age).
- Human lifetime is 70 years.
- Time a person lives a one residence is 30 years.

Exposure doses from inhalation of air can be calculated as follows:

$$D = (C \times IR \times EF) / BW$$

D = exposure dose (mg/kg/day)
 C = contaminant concentration (mg/m³)
 IR = intake rate (m³/day)
 EF = exposure factor (unitless)
 BW = body weight (kg)

Exposure Factor can be calculated as follows:

$$EF = (F \times ED) / AT$$

F = frequency of exposure (days/year)
 ED = exposure duration (years)
 AT = averaging time (ED x 365 days/year)

Potential Carbon Tetrachloride Exposure Scenario	Adult Dose (mg/kg/day)
Scenario 1: A USDA-APHIS/WS employee spending one 8-hour workday, one day each month, over the course of a 30-year career, in the contaminated portion of Clover Creek. The ambient air over that portion of the creek contains an estimated concentration of 0.22 ppb carbon tetrachloride.	0.042
Scenario 2: A USDA-APHIS/WS employee spending one 8-hour workday, one day each week, over the course of a 30-year career, in the contaminated portion of Clover Creek. The ambient air over that portion of the creek contains an estimated concentration of 0.22 ppb carbon tetrachloride.	0.209
Scenario 3: Any person in the United States breathing the lowest background concentration of 0.14 ppb carbon tetrachloride in ambient air over the course of their lifetime.	0.959
Scenario 4: Any person in the United States breathing the highest background concentration of 0.29 ppb carbon tetrachloride in ambient air over the course of their lifetime.	1.918
Scenario 5: Any person in the United States breathing the average indoor air concentration of 0.40 ppb carbon tetrachloride in their home for the maximum amount of time living in that home.	1.543

APPENDIX C

Additional Information for Citizens

The Tennessee Department of Health, Environmental Epidemiology (TDH-EEP) prepared this public health consultation for the Jackson District of the U.S. Department of Agriculture's (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) agency. It was specifically written to address their concerns about worker exposure to carbon tetrachloride contamination in the waters of Clover Creek. However, the TDH-EEP recognizes that there could be other parties or persons with concerns about groundwater and surface water quality and safety in the vicinity that surrounds the Velsicol Chemical Corporation Landfill (VCCL) that were not addressed by this document.

Therefore, the TDH-EEP would recommend that persons with concerns and questions about groundwater, surface waters (i.e., streams, creeks, rivers), and drinking water from private wells and municipal water systems in the geographic vicinity of the VCCL, contact the Tennessee Department of Environment and Conservation (TDEC). TDEC is the state's environmental regulatory agency responsible for the oversight of hazardous waste sites such as the VCCL. TDEC maintains an environmental field office in Jackson, Tennessee, and Hardeman county falls within the jurisdiction of that field office. For information or assistance concerning any type of environmental matters in the vicinity of the VCCL, contact TDEC offices in Jackson, Tennessee toll free at 1-888-891-8332.

There may also be citizens that may have concerns about consuming fish caught in the streams around the VCCL vicinity. Persons desiring specific information regarding aquatic contaminants, fishing advisories, or potentially adversely affected waters in their area can contact the Tennessee Wildlife Resources Agency (TWRA), Region 1 offices (Local, 731-423-5725; In-State toll free, 1-800-372-3928) for information and assistance.

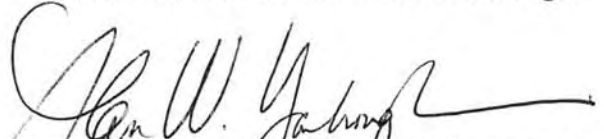
Certification

This Public Health Consultation (*Clover Creek Workers, Toone, Hardeman County, Tennessee*) was prepared by the Tennessee Department of Health Environmental Epidemiology under a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It was prepared in accordance with the approved methodology and procedures that existed at the time the health consultation was begun. The editorial review was completed by the cooperative agreement partner.



Technical Project Officer, CAT, SPAB, DHAC, ATSDR

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



Team Leader, CAT, SPAB, DHAC, ATSDR