

Health Consultation

TOWN AND COUNTRY CLEANERS

NASHVILLE, DAVIDSON COUNTY, TENNESSEE

EPA FACILITY ID: TND982137267

DCERP FACILITY ID: D-19-122

AUGUST 18, 2005

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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 conduction 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 that, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

TOWN AND COUNTRY CLEANERS

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Prepared by:

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

Background and Statement of Issues

In October 2004, the Tennessee Department of Environment and Conservation (TDEC), Division of Remediation (DOR), Drycleaner Environmental Response Program (DCERP), contacted the Tennessee Department of Health (TDH), Environmental Epidemiology (EEP). DCERP requested that EEP review environmental sampling data to assess the potential for indoor air quality concerns related to Town and Country Cleaners and a neighboring commercial building (the Bradford Building). The Town and Country Cleaners facility is located at 4044 Hillsboro Pike, Nashville, Davidson County, Tennessee, 37215 (Figures 1 & 2).

Historically, the drycleaning industry has used several different solvents as cleaners. The drycleaner solvent of concern at this site is tetrachloroethylene (PCE). At sites where drycleaning was performed for many years, it is not uncommon to find that cleaning solvents lost through routine operations have contaminated the soils and groundwater underneath the building. In some cases the contamination may spread to adjacent properties. The State of Tennessee established the DCERP to provide oversight of the voluntary clean up activities conducted on properties where drycleaning operations have lead to environmental pollution.

The Town and Country Cleaners building was constructed around 1960 and has housed an active drycleaning business since that time. In 1997, Town and Country Cleaners entered into the DCERP and is registered as Facility #D-19-122. During the course of an Environmental Assessment, two shallow monitoring wells were constructed on the property. PCE was detected in the groundwater samples collected from the monitoring wells.

Town and Country Cleaners and the Bradford Building (adjoining property to the south of the drycleaner property; Figure 3) front Hillsboro Pike, a major urban highway. They are located within a densely developed commercial area. The Bradford Building is a two-story structure with an extensive basement. A narrow alley separates the two buildings, however, the basement of the Bradford Building extends beneath the alley road surface and abuts the drycleaner property. There are several commercial tenants that lease space in the Bradford Building, including a furniture and carpet store in the basement space.

The Bradford Building had problems with water intrusion into the basement after its construction was completed. A drainage system was installed in the basement floor to intercept and direct the water into three sumps. The water collected in the sumps is then pumped to the sanitary sewer. The amount of water present in the sumps appears to vary with the seasons. DCERP documents report that only two of the three sumps have had sufficient levels of water to collect samples during scheduled environmental sampling events. The two sumps that could be sampled were both found to contain PCE and its break down products. The highest contaminant concentrations were detected in the samples obtained from the sump located in the small basement storage room (Figure 5).

In order to determine the potential impact of volatile organic compound (VOC) vapor intrusion into the Town and Country Cleaners building and the Bradford Building, DCERP asked that year-long indoor air quality monitoring be conducted. This type of long-term sampling is conducted to identify the presence and levels of VOC vapors inside buildings, and to evaluate whether the indoor air quality is adversely affected. The initial work plan specified collecting quarterly indoor air samples at the predetermined locations inside the two buildings.

At the time the indoor air quality monitoring work plan was approved, Town and Country Cleaners was supposedly not in operation as an active drycleaner, and therefore not utilizing PCE. Thus, Station A (Figure 4) was established to determine whether any potential indoor air quality concerns might exist to the employee/occupants of the former drycleaner. Station B (Figure 4 & 5) was located inside the small basement storage room housing the sump containing the water with the highest levels of PCE and its break down products. Station C (Figure 4) was located in the basement area that is geographically closest to where drycleaner wastes had historically been stored on the Town and Country Cleaners property.

On September 16, 2004, ENSAFE Inc., was authorized by DCERP, to collect indoor air samples utilizing standard SUMMA canisters. The canisters were placed in the Town and Country Cleaners site (Station A), and within the Bradford Building basement (Stations B & C).

On December 20, 2004, TDH EEP staff visited the Town and Country Cleaners site and the Bradford Building with the DCERP project manager and the ENSAFE project manager. EEP staff were able to view the indoor air sampling points (Stations A, B, & C) and the general layout of the site as it relates to the surrounding properties (Figure 4). The SUMMA canisters were placed for the second quarter of indoor air sampling.

Following the December 2004 sampling event, it was discovered that Town and Country Cleaners was operating as an active drycleaner under new management. Since PCE was being utilized inside the facility, the DCERP project manager determined that Station A would no longer be utilized as an indoor air sampling point. The indoor air samples that would have been collected at Station A were then assigned to a new sample point located in the basement of the Bradford Building. The new sampling point, designated as Station D, is located in the retail showroom area approximately 20 feet north of Station B (Figure 4).

On March 24, 2005, ENSAFE Inc. collected the third quarter indoor air samples. The SUMMA canisters were placed only within the Bradford Building basement at the designated indoor air sampling points (Stations B, C, & D). The DCERP project manager determined that Station A's previous indoor air sampling results from the cleaners should not be included in this document as this is an active drycleaner facility. Thus, the laboratory analytical data from the storage room sump water and indoor air samples collected from the Bradford Building basement will be the focus of this health document.

Discussion

Introduction to Chemical Exposure

To determine whether persons have been, are, 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:

1. a source of contamination,
2. contaminant transport through an environmental medium, such as air, soil, or water,
3. a point of exposure,
4. a route of human exposure, and
5. a receptor population.

An exposure pathway is considered complete if there is evidence that all five of these elements have been, are, 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.

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

- the route of exposure (inhalation, ingestion, dermal contact),
- 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.

Potentially Exposed Populations

A completed exposure pathway exists in the Bradford Building basement for workers and customers. Drycleaner solvent or its breakdown products in the sump water could potentially be a dermal contact hazard, and volatilized in the air could potentially be an inhalation hazard.

Environmental Sampling

Sump Water

Water samples have been collected from two of the Bradford Building's three sumps. Of the two sumps sampled, the water in the storage room sump was found to contain higher concentrations of drycleaner solvent and its breakdown products. This sump is located on the west side of the building and corresponds to Station B as shown in Figure 4. The storage room is approximately 6 feet by 8 feet wide and 9 feet in height. The sump is in the southwest corner of the storage room and is approximately 4 feet in diameter and 5 feet in depth (Figure 5).

Laboratory analyses of water samples from the sump are shown in Table 1 (ENSAFE 2000, 2001, 2004, 2005). The analyses confirm the presence of drycleaner solvent and its breakdown products in the water present in the sump. PCE in the groundwater can breakdown into one or more of the following chemicals: trichloroethylene, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, 1,1-dichloroethylene, and vinyl chloride.

TABLE 1. Summary of analytical results for drycleaner solvent and its breakdown products in water collected from the storage room sump. Results are reported in parts per billion (ppb or µg/L).							
Chemical	Sampling Date						
	4/5/00	8/8/00	6/5/01	10/5/01	4/22/03	9/16/04	3/24/05
tetrachloroethylene	3065	380	17000	160	495	2200	1520
trichloroethylene	250	24	5000	10	87	300	229
cis-1,2-dichloroethylene	320	64	3000	32	87	420	322
trans-1,2-dichloroethylene	15	1	U	U	U	U	2.6
1,1-dichloroethylene	U	U	U	U	U	U	U
vinyl chloride	U	U	U	U	U	U	U
U - Analyte not detected above detection limits							

An exposure pathway via the sump water, though present in the Bradford Building, does not present a high potential for human exposure. With regard to the sump water, the potential route of human exposure would be through skin contact (dermal contact). However, the storage room where the sump is located is locked and closed to public access. There is no evidence that commercial tenants of the Bradford Building, or their customers, come into contact with the sump water for any purpose at any time. The water collected in the sump is pumped directly to the sanitary sewer for removal from the property. Therefore, the potential for dermal contact with the sump water by the general population would be negligible. The population most likely to be exposed to the sump water would be building maintenance workers that could come into contact with the water, for a limited period of time, while conducting repairs to the sump.

The literature documents cases of adverse health effects from prolonged dermal contact with PCE and its breakdown products in their pure chemical forms or at high concentrations. However, the literature does not specifically describe any adverse health effects from limited dermal contact with PCE or its breakdown products at the concentration levels found in the sump water of the Bradford Building (ATSDR 1997).

Air

Concerns regarding the indoor air quality in the Bradford Building basement arose when laboratory analysis confirmed the presence of PCE and its breakdown products in the storage room sump water. Since these chemicals readily volatilize and enter into the air, DCERP directed ENSAFE to conduct indoor air monitoring to confirm whether VOCs were present. Indoor air samples were collected utilizing the industry standard SUMMA canisters. The canisters were suspended approximately 60 inches above the floor to sample air from the breathing zone at each of the at the assigned indoor air sampling stations (Figure 4). Indoor air samples were taken in September 2004, December 2004, and March 2005. Table 2 (ENSAFE 2004, 2005) shows the results of the laboratory analysis of the indoor air samples.

TABLE 2. Results of SUMMA canister indoor air sampling for vapors from drycleaner related solvent and its breakdown products in parts per billion (ppb).							
Chemical	Quarterly Vapor Monitoring Sampling Events						
	1st Quarter September 16, 2004		2nd Quarter Dec. 20, 2004		3rd Quarter March 24, 2005		
	Station		Station		Station		
	B	C	B	C	B	C	D
tetrachloroethylene	45.7	14.0	1117.8	12.4	488.1	10.5	11.3
trichloroethylene	9.3	U	110.9	38.9	60.5	U	1.1
cis-1,2-dichloroethylene	18.9	U	90.8	2.2	70.6	0.9	1.0
trans-1,2-dichloroethylene	U	U	1.5	U	U	U	U
1,1-dichloroethylene	U	U	U	U	U	U	U
1,1-dichloroethane	U	U	U	U	U	U	U
1,2-dichloroethane	U	U	U	U	U	U	U
vinyl chloride	U	U	U	U	U	U	U
U - Analyte not detected above detection limits							

The inhalation exposure pathway is present for PCE, trichloroethylene (TCE), and cis-1,2-dichloroethylene (cis-1,2-DCE) in the basement of the Bradford Building. Since the basement houses commercial retail businesses, there would be two populations that could potentially be exposed to the drycleaner related solvent vapors. They are the customers visiting the businesses in the basement, and the employees working in the basement.

The customers are essentially a transient population. They occasionally enter the basement for brief periods of time and then leave. Thus, potential customer exposure to the VOC vapors would be very limited, as in minutes per day. Compared to customers, employees working in the basement would have a higher potential for longer periods of exposure. Employee exposure would be on a daily basis and measured in hours per day.

The businesses occupying the basement are retail in nature and do not use PCE for business purposes. Therefore, the exposure of these employees to VOC vapors cannot be considered as occupational. Occupational (or industrial) standards are generally based upon preventing adverse health effects from exposure over a 40-hour workweek. Thus, the use of an occupational exposure standard, such as the Occupational Safety and Health Administration (OSHA), Permissible Exposure Limit (PEL) would not be appropriate for this exposure evaluation.

An environmental standard would be applicable to this VOC exposure scenario. Environmental standards are utilized for locations other than those of an industrial-type. The most common application for environmental exposure standards is for residential settings. The Agency for Toxic Substances and Disease Registry's (ATSDR) Minimal Risk Level (MRL) is considered as a residential standard and would be applicable for this scenario. An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure.

The ATSDR MRL for chronic inhalation exposure to PCE in air is 40 parts per billion (ppb). The VOC indoor air sampling results for Station B show that the average PCE concentration level (i.e. an average of the three sampling events to date) of 550 ppb. That level is 13 times greater than the MRL. However, the storage room where the sump is located is locked and closed to public access. There is no evidence to suggest that customers would ever enter the storage room for any purpose. Employees (including building maintenance workers) occasionally enter the storage room, however they would not remain inside it for any appreciable length of time.

The ATSDR MRL for intermediate inhalation exposure to TCE in air is 100 ppb. The VOC indoor air sampling results for Station B shows that the average TCE concentration level has been 60 ppb. Thus, the potential exposure for TCE is less than the MRL.

There is no inhalation assessment for cis-1,2-DCE. However, there is an inhalation MRL for trans-1,2-dichloroethylene (trans-1,2-DCE) which is chemically very similar to cis-1,2-DCE. Therefore, the MRL for trans-1,2-DCE be utilized as the MRL for cis-1,2-DCE. The ATSDR MRL for intermediate inhalation exposure to trans-1,2-DCE in air is 200 ppb. The VOC indoor air sampling results for Station B shows that the average cis-1,2-DCE concentration level has been 60 ppb. Thus, the potential exposure for cis-1,2-DCE is less than the MRL.

The VOC indoor air sampling results for Stations C and D (i.e. human occupied areas) show that highest PCE concentration level of 14 ppb was in September 2004. All readings from subsequent indoor air sampling events have been below 14 ppb. Thus, the indoor air concentrations for PCE have been at least two times lower than the MRL of 40 ppb.

The highest TCE concentration level of 38.9 ppb was recorded in December 2004 at Station C. However, the highest measured concentration is two times lower than the MRL of 100 ppb. All other sampling results for TCE at Stations C and D during the other sampling events have been below 2 ppb.

The cis-1,2-DCE concentration levels at Stations C and D have not exceeded 3 ppb. The indoor air concentration for cis-1,2-DCE has thus far been over fifty times lower than the MRL of 200 ppb.

The work plan approved by DCERP calls for four quarterly indoor air-sampling events for the Town and Country Cleaners. One quarterly indoor air-sampling event thus remains to be completed for this facility.

Tetrachloroethylene (PCE) $\text{Cl}_2\text{C}=\text{CCl}_2$

Tetrachloroethylene (PCE) is commonly called “perchloroethylene” or “*perc*” in the drycleaning industry. Introduced in the 1930s, PCE is the solvent, or cleaning agent, most often used by professional drycleaners. PCE removes stains and dirt from all common types of fabric. PCE does not usually cause clothes to shrink or dyes to bleed. PCE is not flammable, unlike many other common solvents. Additionally, PCE can be reclaimed after the drycleaning process and reused, helping to make it a cost-effective professional cleaner.

Tetrachloroethylene (PCE) is a clear, colorless liquid said to produce a sharp, sweet smell. It evaporates very readily at room temperature. PCE is a synthetic chemical and is often used as a starting point for the manufacture of other chemicals (ATSDR 1997). If PCE is released to surface water or surface soil, it will mostly evaporate into the air and disperse. PCE is in a class of chemicals called DNAPLs (Dense Non-Aqueous Phase Liquids). Due to the chemical properties of DNAPLs, PCE can readily travel through soil and enter into groundwater. Once in the groundwater, PCE does not easily dissolve in to the water, and can remain there for many months and years with very little chemical breakdown or change.

People can detect the smell of PCE in the air at 1 part per million (ppm) or more. Background concentration of PCE in the environment is usually less than 1 ppb. PCE is used in certain consumer products including water repellents, silicone lubricants, fabric finishers, spot removers, adhesives, and wood cleaners. PCE has been widely used in the drycleaning industry for decades. Clothes brought home from a drycleaners may release small amounts of PCE into the air. The significance of exposure to small amounts of PCE is unknown, but to date, they appear to be relatively harmless (ATSDR 1997).

Trichloroethylene (TCE) $\text{HCIC}=\text{CCl}_2$

Trichloroethylene (TCE) is a clear, colorless liquid said to produce a sharp, sweet odor and a sweet, burning taste. It is nonflammable and evaporates easily at room temperature. If TCE is released to surface water or surface soil, it will mostly evaporate into the air and disperse. TCE is also in the class of DNAPLs and can also readily travel through soil with little impedence and enter into groundwater. Once in the groundwater, TCE does not easily dissolve in to the water, and thus it can remain there for many months and years with very little chemical breakdown or change. TCE is also a break down product of PCE. PCE that has been released into the environment can be biodegraded (chemically altered by microbiologic organisms) and broken down into TCE.

Most people can detect the smell of TCE in air at around 100 ppm. Background concentration of TCE in the environment is usually less than 1 ppb. TCE is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers (ATSDR 1997).

cis-1,2-Dichloroethylene (cis-1,2-DCE) ClHC=CClH

cis-1,2-Dichloroethylene (cis-1,2-DCE) is an isomer, or form, of 1,2-Dichloroethylene (1,2-DCE). The other isomer of 1,2-DEC is trans-1,2-Dichloroethylene (trans-1,2-DCE). Isomers are molecules with the same chemical formula, but with different arrangements of their atomic structure. Most isomers share similar, if not identical, properties in most chemicals.

1,2-DCE is a colorless liquid with a sharp, harsh odor. It is highly flammable and evaporates rapidly at room temperature. 1,2-DCE is a synthetic chemical and is used in the manufacture of other chemicals (ATSDR 1996). If 1,2-DCE is released to surface water or surface soil, it will mostly evaporate into the air and disperse. 1,2-DCE is also in the class of DNAPLs and can also readily travel through soil and enter into groundwater. Once in the groundwater, one half of a given volume of 1,2-DCE will break down in about 13-48 weeks (i.e. half-life in water). 1,2-DCE is also a break down product of TCE.

Most people detect the smell of 1,2-DCE in air at around 17 ppm. Background concentration of 1,2-DCE in ambient air is usually less than 1 ppb (ATSDR 1996).

Children's Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than adults from certain kinds of exposure to hazardous substances (ATSDR 1997, 1998). Children have lower body weights than adults. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus, adults need as much information as possible to make informed decisions regarding their children's health. In the preparation of this health document, the health of children was thoughtfully considered. No health threats unique to children that require special attention were observed during this drycleaner solvent investigation of the Town and Country Cleaners and neighboring Bradford Building.

Conclusions

1. No apparent health hazard exists from drycleaner solvent or its breakdown products in the sump water of the Bradford Building.
2. No apparent health hazard exists from drycleaner solvent or breakdown product vapors in the basement of the Bradford Building.
3. No assessment of the Town and Country Cleaners (DCERP Facility #D-19-122) was made, as it is now an operating drycleaner business under new management.

Recommendations

1. Complete the DCERP approved Vapor Monitoring work plan for the Town and Country Cleaners site.

Public Health Action Plan

1. TDH EEP will provide copies of this health consultation to TDEC DCERP, the management of Town and Country Cleaners, and the management and occupants of the Bradford Building.
2. TDH EEP will continue to work with TDEC DCERP as needed as Town and Country Cleaners goes through DCERP regulatory process.
3. TDH EEP is available to review additional data.

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FIGURE 1 - Map of the location of Town and Country Cleaners, 4044 Hillsboro Pike, Nashville, Davidson County, Tennessee, 37215 and vicinity. (Map Credit: MapQuest.com)

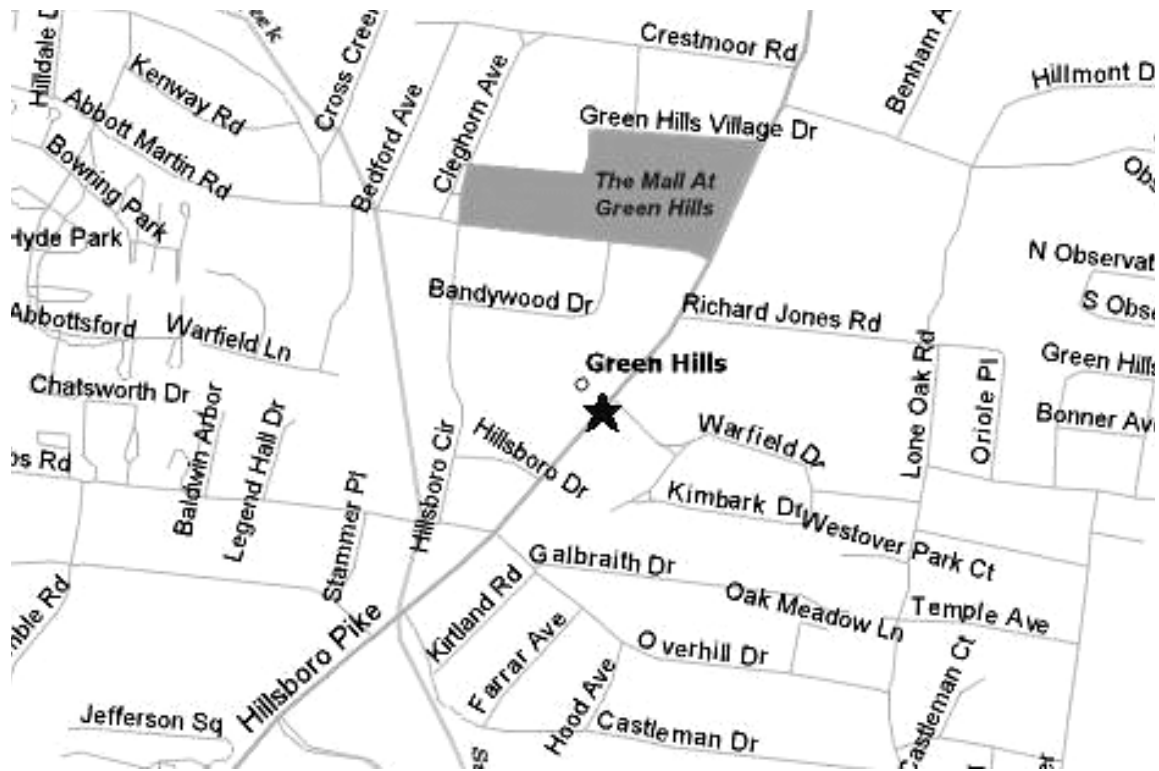


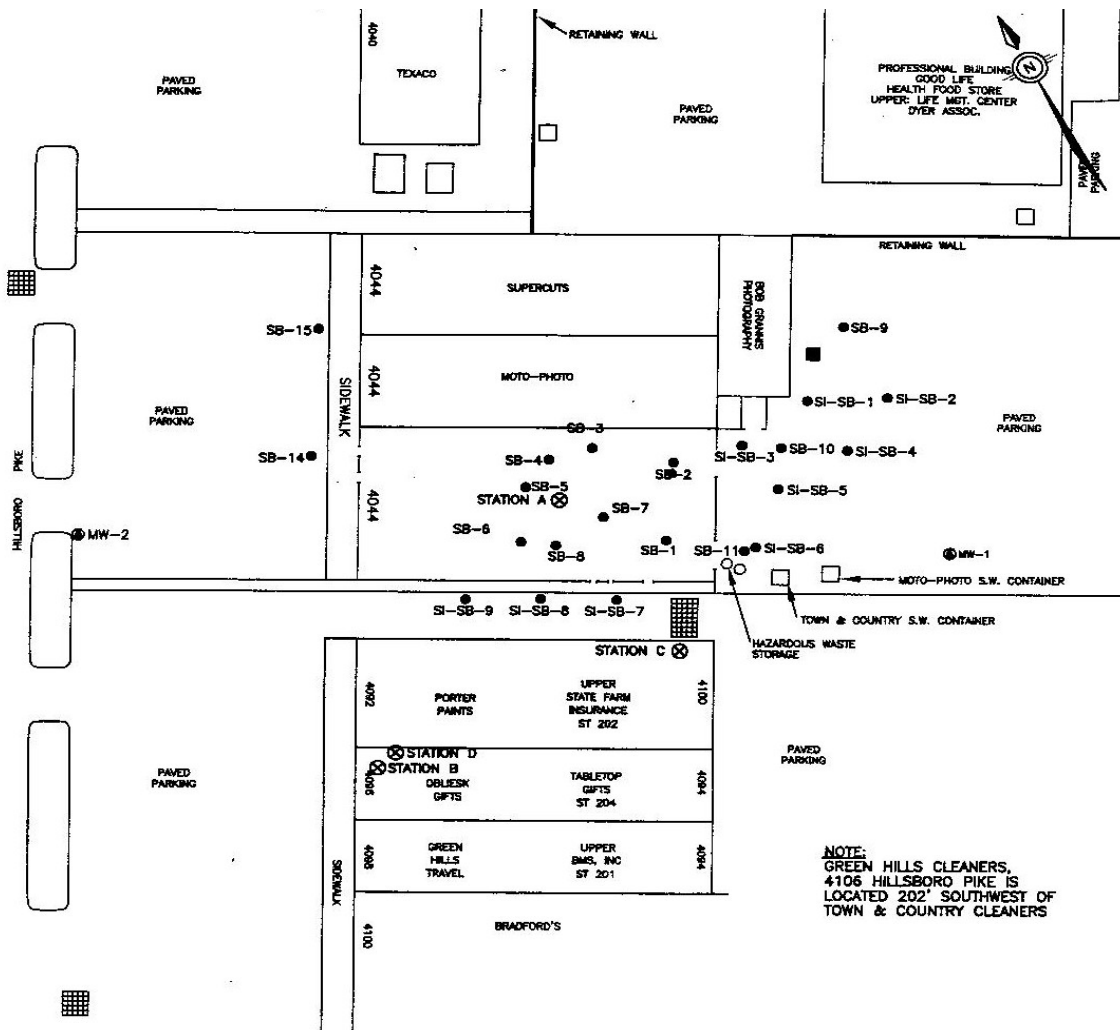
FIGURE 2 - Photo of the storefront, Town and Country Cleaners, 4044 Hillsboro Pike. Nashville, Davidson County, Tennessee. (Photo credit: David Borowski, TDH, 12/20/04)



FIGURE 3 - Photo of the storefront, Bradford Building, 4094 Hillsboro Pike. Nashville, Davidson County, Tennessee. (Photo credit: David Borowski, TDH, 12/20/04)



FIGURE 4 - Schematic Layout of the Town and Country Cleaners site and the adjacent properties and businesses. Also denoted on this drawing are the indoor air (vapor) sampling locations within the Bradford Building (Station B, C, & D). (Drawing credit: ENSAFE Inc.)



NOTE:
GREEN HILLS CLEANERS,
4106 HILLSBORO PIKE IS
LOCATED 202' SOUTHWEST OF
TOWN & COUNTRY CLEANERS

LEGEND

- - FLOOR DRAIN
- ⊗ - VAPOR SAMPLING LOCATION
- (gridded) - STORM DRAIN
- - SOLID WASTE CONTAINER
- (with dot) - DPT SOIL BORING LOCATION
- ⊕ (with vertical line) - BEDROCK MONITORING WELL



ENSAFE

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FIGURE 1
VAPOR MONITORING LOCATIONS
TOWN & COUNTRY CLEANERS
4044 HILLSBORO PIKE FACILITY NO. D-19-122
NASHVILLE, TENNESSEE 37215

DWG DATE: 11APR05 | DWG NAME: 4005155R004

FIGURE 5 - The small basement storage room (indoor air sampling Station B) within the Bradford Building where a sump pump is located. Water samples were collected from this sump. (Photo credit: David Borowski, TDH, 12/20/04)



Certification

This Health Consultation: Town and Country Cleaners, Nashville, Davidson 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 way begun.

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Technical Project Officer, SPS, SPAB, DHAC, ATSDR

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

_____ Richard Gillig _____
Chief, State Program Section, SPAB, DHAC, ATSDR