Health Consultation

Evaluation of Follow-Up Indoor Air Sampling Results
(January – March 2007) at the
Washington Traffic Safety Commission Offices

TMC CLEANERS
(a/k/a HOWARD'S CLEANERS and OLYMPIA CLEANERS)
OLYMPIA, THURSTON COUNTY, WASHINGTON

EPA FACILITY ID: WAH000017277

AUGUST 31, 2007

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:

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

Foreword

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of this health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. Health consultations focus on specific health issues so that DOH can respond to requests from concerned residents or agencies for health information on hazardous substances. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health. The findings in this report are relevant to conditions at the site during the time of this health consultation, and should not necessarily be relied upon if site conditions or land use changes in the future.

For additional information or questions regarding DOH or the contents of this health consultation, please call the health advisor who prepared this document:

Gary Palcisko
Washington State Department of Health
Office of Environmental Health Assessments
P.O. Box 47846
Olympia, WA 98504-7846
(360) 236-3377
FAX (360) 236-3383
1-877-485-7316
Web site: www.doh.wa.gov/ehp/oehas/sashome.htm

For persons with disabilities this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (voice) or 1-800-833-6388 (TTY/TDD).

For more information about ATSDR, contact the ATSDR Information Center at 1-888-422-8737 or visit the agency's Web site: www.atsdr.cdc.gov/.

Glossary

Acute	Occurring over a short time [compare with **chronic**].
Agency for Toxic Substances and Disease Registry (ATSDR)	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
Aquifer	An underground formation composed of materials such as sand, soil, or gravel that can store and/or supply groundwater to wells and springs.
Cancer Risk Evaluation Guide (CREG)	The concentration of a chemical in air, soil or water that is expected to cause no more than one excess cancer in a million persons exposed over a lifetime. The CREG is a *comparison value* used to select contaminants of potential health concern and is based on the *cancer slope factor* (CSF).
Cancer Slope Factor	A number assigned to a cancer causing chemical that is used to estimate its ability to cause cancer in humans.
Carcinogen	Any substance that causes cancer.
Chronic	Occurring over a long time (more than 1 year) [compare with **acute**].
Comparison value	Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.
Contaminant	A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.
Dose (for chemicals that are not radioactive)	The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.
Environmental Protection Agency (EPA)	United States Environmental Protection Agency.

Epidemiology	The study of the occurrence and causes of health effects in human populations. An epidemiological study often compares two groups of people who are alike except for one factor, such as exposure to a chemical or the presence of a health effect. The investigators try to determine if any factor (i.e., age, sex, occupation, economic status) is associated with the health effect.
Exposure	Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [**acute exposure**], of intermediate duration, or long-term [**chronic exposure**].
Groundwater	Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].
Hazardous substance	Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.
Inhalation	The act of breathing. A hazardous substance can enter the body this way [see **route of exposure**].
Lowest Observed Adverse Effect Level (LOAEL)	The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.
Media	Soil, water, air, plants, animals, or any other part of the environment that can contain contaminants.
Minimal Risk Level (MRL)	An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see **reference dose**].
Model Toxics Control Act (MTCA)	The hazardous waste cleanup law for Washington State.
Monitoring wells	Special wells drilled at locations on or off a hazardous waste site so water can be sampled at selected depths and studied to determine the movement of groundwater and the amount, distribution, and type of contaminant.
No Observed Adverse Effect Level (NOAEL)	The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

Organic	Compounds composed of carbon, including materials such as solvents, oils, and pesticides that are not easily dissolved in water.
Parts per billion (ppb)/Parts per million (ppm)	Units commonly used to express low concentrations of contaminants. For example, 1 ounce of trichloroethylene (TCE) in 1 million ounces of water is 1 ppm. 1 ounce of TCE in 1 billion ounces of water is 1 ppb. If one drop of TCE is mixed in a competition size swimming pool, the water will contain about 1 ppb of TCE.
Route of exposure	The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].
Volatile organic compound (VOC)	Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Purpose

The purpose of this health consultation is to evaluate health risks to workers at the Washington Traffic Safety Commission (WTSC) from exposure to volatile organic compounds (VOCs) associated with contamination at TMC Cleaners. The Washington State Department of Health prepared this health consultation in response to indoor air quality concerns raised by the some staff at WTSC regarding potential exposure to tetrachloroethylene (PCE) in indoor air. This health consultation is a follow-up to a previous indoor air-sampling event that revealed slightly elevated levels of PCE in indoor air. Renewed health concerns were raised in December 2006 when an employee of WTSC became ill concurrent with remedial activities at TMC Cleaners. DOH prepares health consultations under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR).

Background and Statement of Issues

TMC Cleaners (TMC), formerly known as Howard's Cleaners and Olympia Drycleaners, is located at 606 E. Union Avenue, Olympia, Washington in a mixed residential and commercial area of downtown. It has operated at this location for over 30 years.

Investigations of the dry-cleaning facility in 1995 and 2002-03 found gasoline, heavy oil, xylene, toluene, PCE, trichloroethylene (TCE), and degradation products of PCE [1,2-dichloroethylene (1,2 DCE), 1,1,1-trichlorethane, vinyl chloride] in groundwater and soil in the vicinity of TMC.[1, 2] Exposure to the contaminants in soil and groundwater was evaluated by DOH in a health consultation dated June 1999.[3] This evaluation concluded that VOCs in soil were not a threat to human health, but employees at WTSC, located nearby at 1000 S. Cherry Street (Figure 2), raised concerns about indoor air quality related to the migration of VOCs from groundwater to indoor air. The WTSC building is located directly adjacent to TMC cleaners (Figure 2).

In July 2002, indoor air samples were taken at WTSC to determine if VOCs migrated from groundwater and impacted workers there.[4] Levels of PCE were above levels typically found in indoor air, but not at levels of concern to public health. These samples, however, were taken in the summer, the season of the year that VOCs are least likely to migrate from groundwater to indoor air. A recommendation to conduct a follow-up sampling in the winter was made in a health consultation dated September 8, 2003.[5]

Follow-up air sampling was conducted in January 2004. Four samples were collected from four areas within WTSC: the reception desk, conference room, south office, and the basement. Samples were analyzed for VOCs using EPA method TO-15. Again, levels of PCE at the reception desk and south office were higher than typically found in indoor air, but not at levels of concern to public health.[6]

In December 2006, renewed concerns at WTSC were raised when soil excavation began at the TMC site. Excavation was conducted on the TMC property adjacent to the south end of the WTSC building. During that time, an employee at WTSC complained of feeling sick. Later reports from her doctors at the University of Washington said she was exposed to PCE (personal communication with Lowell Porter, Director of the Washington Traffic Safety Commission). In

light of that report, WTSC building occupants expressed concern about the safety of their workplace and requested a follow-up indoor air evaluation. Initially, Thurston County Health Department (TCHD) used a portable photoionization detector (PID) to determine if VOCs were present at levels greater than one part per million (ppm). No VOCs were detected at or above that level.

DOH and TCHD placed three Summa canisters at the WTSC on March 19, 2007 to determine if VOCs were present in indoor air at levels below 1 ppm, but at levels of concern. One canister was placed in the south office (closest to TMC and the office of employee who became ill), the reception desk, and office at the north end of the building. These samples were analyzed for VOCs using EPA method TO-15.

In addition to samples collected by DOH, a consultant hired by the WTSC property owner collected six samples in January 2007.[7] The results of the samples were shared with DOH in April 2007 and are reported along with other sampling results.

Discussion

Air sampling data were screened using ATSDR, U.S. Environmental Protection Agency (EPA), and Washington State Department of Ecology (Ecology) health-based criteria, or comparison values (Appendix A). Contaminant concentrations below comparison values are unlikely to pose a health threat, and were not further evaluated. Appendix A, Table A1 shows chemicals that were detected in WTSC air samples in relation to their respective comparisons values. Contaminant concentrations exceeding comparison values do not necessarily pose a health threat, but are further evaluated to determine whether they are at levels that could result in adverse human health effects or increased health risk.

No contaminants exceed noncancer comparison values indicating that exposure to levels measured at WTSC are not likely to result in adverse noncancer health effects. PCE, TCE, carbon tetrachloride, and benzene levels in indoor air at WTSC exceeded respective cancer based health comparison values and were evaluated for cancer health effects.

Measured concentrations of chemicals that exceed comparison values from the 2007 sampling event are presented in Table 1 in relation to 2002 and 2004 results. PCE levels were lower in the most recent sampling rounds compared to the 2002 and 2004 results. Benzene results show little change from 2002 to most recent sampling events. It cannot be determined if the recent removal of soil adjacent to WTSC has caused the decreased PCE levels in indoor air there, or if the levels have permanently decreased without additional study.

Table 1. Results of air samples ($\mu g/m^3$) taken 2002, 2004, and 2007 from Washington State Traffic Commission near the TMC Drycleaner site Olympia, Washington[8]

Date	Location	Benzene	Carbon Tetrachloride	PCE	TCE
July 2002	Reception	2.1	NR	8.7	<2.5
	South Office	1.7	NR	31	3.6
	Conference Room (North Office)	1.5	NR	7.1	<1.8
	Basement	1.5	NR	3.3	<1.8
January 2004	Reception	1.8	NR	20	0.98
	South Office	1.8	NR	39	1.3
	Conference Room (North Office)	1.6	NR	3.4	0.22
	Basement	1.5	NR	3.7	0.23
January 2007	Multiple Locations [b]	2.2-2.4	NR	0.56-0.95	0.10-0.20
March 2007	Reception	1.3	<0.44	<0.61	<0.43
	South Office	1.2	~0.51	~0.64	<0.43
	Conference Room (North Office)	1.2	~0.53	<0.61	<0.43
	Basement	NA	NA	NA	NA
	Median indoor levels in U.S.	10	2.6 [a]	5	0.7

a- Mean value instead of median
b- Six samples were taken on January 29, 2007. Five samples were taken on the main level, and one was taken in the basement.
NA – Not analyzed
NR – Not reported
~ indicates the reported contaminant level is an estimate
< indicates the contaminant was not detected at the reported detection limit

Background Levels

The wide use of natural and synthetic chemicals is a part of modern life, and as a result, ambient and indoor air always contains low levels of these chemicals. Therefore, background levels of PCE, carbon tetrachloride, and benzene must be examined in order to determine whether or not levels found at WTSC are typical of urban indoor air. Table 1 shows that PCE, TCE, carbon tetrachloride and benzene levels are within typical ambient levels at all locations in the building.

Evaluating Cancer Risk

Some chemicals have the ability to cause cancer. Cancer risk is estimated by calculating a dose that a person would receive assuming they breathed PCE and TCE at levels measured in each of the businesses, and multiplying it by a cancer potency factor, also known as the cancer slope factor. Some cancer slope factors are derived from human population data. Others are derived from laboratory animal studies involving doses much higher than are encountered in the environment. Use of animal data requires extrapolation of the cancer potency obtained from these high dose studies down to real-world exposures. This process involves much uncertainty.

Current regulatory practice assumes that there is no "safe dose" of a carcinogen and that a very small dose of a carcinogen will give a very small cancer risk. Cancer risk estimates are not yes/no answers but measures of chance (probability). Such measures, however uncertain, are useful in estimating the magnitude of a cancer threat. The validity of the "no safe dose" assumption for all cancer-causing chemicals is not clear. Some evidence suggests that certain chemicals considered to be carcinogenic must exceed threshold of tolerance before initiating cancer. For such chemicals, risk estimates are not appropriate. More recent guidelines on cancer risk from EPA reflect the potential that thresholds for some carcinogenesis exist. However, EPA still assumes no threshold unless sufficient data indicate otherwise.[9]

This document describes cancer risk that is attributable to site-related contaminants in qualitative terms like low, very low, slight and no significant increase in cancer risk. These terms can be better understood by considering the population size required for such an estimate to result in a single cancer case. For example, a low increase in cancer risk indicates an estimate in the range of one cancer case per ten thousand persons exposed over a lifetime. A very low estimate might result in one cancer case per several tens of thousands exposed over a lifetime and a slight estimate would require an exposed population of several hundreds of thousands to result in a single case. DOH considers cancer risk to be not significant when the estimate results in less than one cancer per one million exposed over a lifetime. The reader should note that these estimates are for excess cancers that might result in addition to those normally expected in an unexposed population. Cancer risks quantified in this document are an upper-bound theoretical estimate. Actual risks are likely to be much lower.

Cancer is a common illness and its occurrence in a population increases with age. Depending on the type of cancer, a population with no known environmental exposure could be expected to have a substantial number of cancer cases. There are many different forms of cancer that result from a variety of causes; not all are fatal. Approximately 25% to 33% of people living in the United States will develop cancer at some point in their lives.[10]

A range of cancer risks was calculated for exposures occurring at WTSC reflecting low and high estimates of cancer slope factors for PCE, and benzene in addition to risk from carbon tetrachloride exposure (see Table B2). Cancer risk ranges from a low-end estimate of eight excess cancers per 10,000,000 people exposed (8×10^{-7}) to a high-end estimate of three excess cancers per 1,000,000 people exposed (3×10^{-6}). These cancer risks are not considered significant and are either below or within the range of risks considered acceptable by EPA (1×10^{-6} to 1×10^{-4}).

Child Health Considerations

ATSDR recognizes that the unique vulnerabilities of infants and children deserve special emphasis with regard to exposures to environmental contaminants. Infants, young children, and the unborn may be at greater risk than adults from exposure to particular contaminants. Exposure during key periods of growth and development may lead to malformation of organs (teratogenesis), disruption of function, and even premature death. In certain instances, maternal exposure, via the placenta, could adversely affect the unborn child.

After birth, children may receive greater exposures to environmental contaminants than adults. Children are often more likely to be exposed to contaminants from playing outdoors, ingesting food that has come into contact with hazardous substances, or breathing soil and dust. Pound for pound of body weight, children drink more water, eat more food, and breathe more air than adults. For example, in the United States, children in the first six months of life drink seven times more water per pound as the average adult. The implication for environmental health is that, by virtue of children's lower body weight, given the same exposures, they can receive significantly higher relative contaminant doses than adults.

Since exposures to infants and young children at WTSC are expected to be infrequent (i.e., much less than the 8-hours/day, 5 days/week assumptions used for this health consultation), the health risks to children are minimal.

Conclusions

1. No apparent public health hazard exists for workers at WTSC exposed to VOCs in indoor air.
    - PCE levels detected in indoor air at WTSC were lower than previous sampling events. Levels found were not likely to cause adverse noncancer health effects in workers there.
    - High-end estimates of cancer risk associated with exposure to PCE, TCE, carbon tetrachloride, and benzene at WTSC are not significant.

Recommendations

1. Follow-up air sampling should be planned to ensure that the remedy chosen by the Department of Ecology eliminates future exposure to workers within WTSC building. This sampling should be conducted as part of the remediation work plan.

Public Health Action Plan

Actions taken

1. DOH has evaluated soil, groundwater, and indoor air data in three prior health consultations.

2. DOH has sampled indoor air at WTSC on three separate occasions to determine the levels of dry-cleaning solvents in indoor air.

Actions Planned

1. DOH will provide copies of this health consultation to workers at WTSC, the Washington State Department of Ecology, and the Thurston County Public Health and Social Services Department.

2. DOH will follow-up with the Washington State Department of Ecology to discuss incorporating the recommendations of this health consult into future work plans.

Preparer of Report

Gary Palcisko
Washington State Department of Health
Office of Environmental Health Assessments
Site Assessment Section

Designated Reviewer

Wayne Clifford, Manager
Site Assessment Section
Office of Environmental Health Assessments
Washington State Department of Health

ATSDR Technical Project Officer

Robert B. Knowles
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Appendix A: Contaminant Screening

Levels of chemicals detected in indoor air at WTSC were compared to health-based comparison values. If a contaminant was found at levels below a comparison value, then it was not evaluated further.

Table A1. Contaminants detected WTSC compared to health-based screening values.

Chemical	CV (noncancer)	CV (cancer)	South Office	North Office	Reception	Max January 2007 results
1,2,4 - Trimethylbenzene	6.2 [a]	NA	1.1J	0.71J	0.64J	NR
2-Butanone (MEK)	5000 [c]	NA	4.9	0.99J	<0.59	NR
4-Ethyltoluene	NA	NA	0.47J	0.47J	<0.34	NR
Acetone	3,300 [a]	NA	18	12	7.7	NR
Benzene	30 [c]	0.1 [d]	1.2	1.2	1.3	2.4
Carbon Disulfide	700 [c]	NA	8.8	0.52J	<0.44	NR
Carbon Tetrachloride	190 [b]	0.07[d]	0.51J	0.53J	<0.44	NR
Chloromethane	90 [c]	NA	1.4	1.1	1.1	NR
Cis-1,2 dichloroethene	NA	NA	<0.28	<0.28	<0.28	0.24
Dichlorodifluoromethane	209 [a]	NA	2.6	2.4	2.2	NR
Ethylbenzene	1,000 [c]	NA	0.74J	0.58J	0.48J	1.2
Methylene Chloride	1,040 [b]	3 [d]	0.31J	0.28J	<0.24	NR
Styrene	250 [b]	NA	0.28J	<0.26	<0.26	NR
Tetrachloroethene	270 [b]	0.32 [a]	0.64J	<0.61	<0.61	0.95
Toluene	300 [b]	NA	4.5	4.4	3.5	5.5
Trichlorethylene	40 [e]	0.02 [a]	<0.43	<0.43	<0.43	0.2
Trichlorofluoromethane	730 [a]	NA	1.3J	1.3J	1.2J	NR
Xylenes (total)	100 [c]	NA	3.1	2.6	2.1J	5.0

NA – Not available
NR – Not reported
a – Environmental Protection Agency Region 9 Preliminary Remediation Goal
b – ATSDR Minimal Risk Level
c – EPA Reference Concentration
d – ATSDR Cancer Reference Evaluation Guide
e– EPA Reference Concentration (TCE health assessment document)[12]
J indicates that the contaminant was detected below the reporting level and the preceding value is an estimate
< indicates that the contaminant was not detected at the numerical level shown

Appendix B: Exposure dose calculations and assumptions

Cancer risk is evaluated by first calculating an average daily dose over a person's lifetime, and then multiplying the dose by a cancer slope factor to produce the probability, or risk of cancer. These equations and exposure assumptions are shown below and in Table B1:

$$Dose_{(cancer\ (mg/kg\text{-}day)} = \frac{C \times CF_1 \times IR \times EF \times ED}{BW \times AT_{cancer}}$$

$$Risk = Dose_{(cancer\ (mg/kg\text{-}day)} \times CSF$$

Table B1. Exposure Assumptions

Parameter	Value	Unit	Comments
Concentration (C)	Variable	ug/kg	Maximum detected value.
Conversion Factor$_1$ (CF_1)	0.001	mg/ug	Converts contaminant concentration from micrograms (ug) to milligrams (mg)
Inhalation Rate (IR)	5	m^3	Volume of air inhaled during 8 hour workday.[a]
Exposure Frequency (EF)	250	days/year	Assumes weekends off and two weeks vacation per year
Exposure Duration (ED)	25	years	Number of years working at one place of employment.
Body Weight (BW) - adult	70	kg	Adult mean body weight
Averaging Time$_{cancer}$ (AT)	25550	days	70 years
Cancer Slope Factor (CSF)	Contaminant-specific	mg/kg-day^{-1}	Source: EPA

a- Inhalation rate adapted from long-term adult male inhalation rate of 15 m^3/day as presented in EPA's Exposure Factors Handbook.[11] Inhalation rate was divided by a factor of 3 to account for and 8-hour work day as opposed to a 24 hour breathing rate.

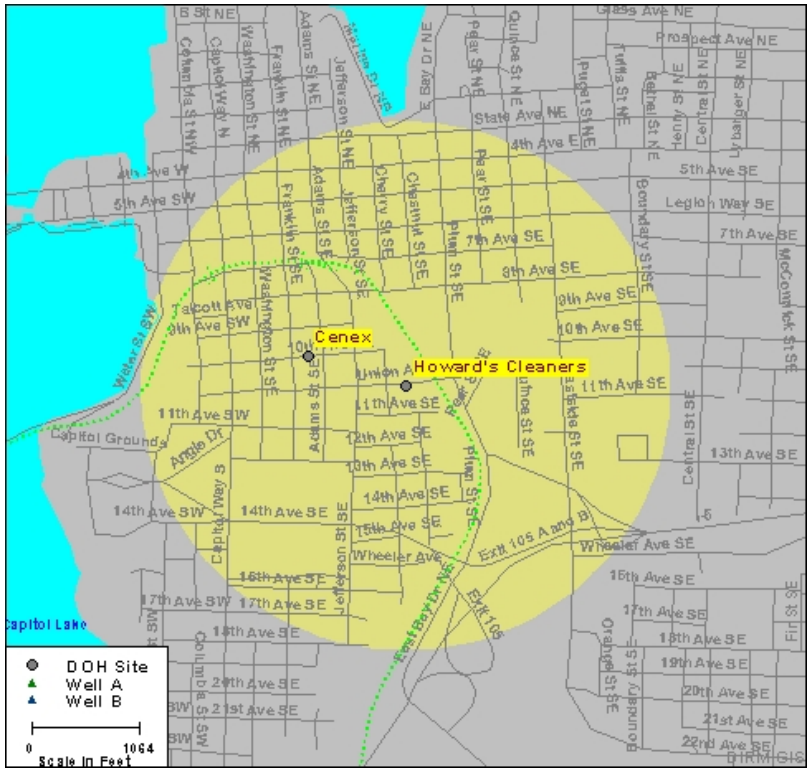
Table B2. Cancer risk associated with exposure to PCE, carbon tetrachloride, and benzene at Washington State Traffic Commission near TMC Cleaners site, Olympia, Washington

Location	**Chemical**	**Concentration** ($\mu g/m^3$)	**Average Daily Dose** (cancer) (mg/kg/day)	**Low-end Cancer Slope Factor** (kg-day/mg) a	**High-end Cancer Slope Factor** (kg-day/mg) a	**Low-end Cancer Risk**	**High-end Cancer Risk**
WSTC	PCE	0.64	1.0e-5	0.002	0.02	2.1e-8	2.1e-7
	TCE	0.2	3.2e-6	0.02	0.4	6.5e-8	1.3e-6
	Carbon Tetrachloride	0.53	8.6e-6	0.06	0.06	5.2e-7	5.2e-7
	Benzene	1.3	2.1e-5	0.008	0.03	1.7e-7	6.4e-7
					Total Cancer Risk	**7.8e-7**	**2.7e-6**

a PCE cancer slope factor ranges from 0.002 (provided by Superfund Technical Support center) to 0.02 as used by Cal EPA and Washington State Department of Ecology. Benzene slope factors adjusted from air unit risk that ranges from 2.2×10^{-6} to 7.8×10^{-6} risk per $\mu g/m^3$

Figure 1. TMC Cleaners (formerly Howard's) site location and demographics. Olympia, Thurston County, Washington

HOWARD'S CLEANERS



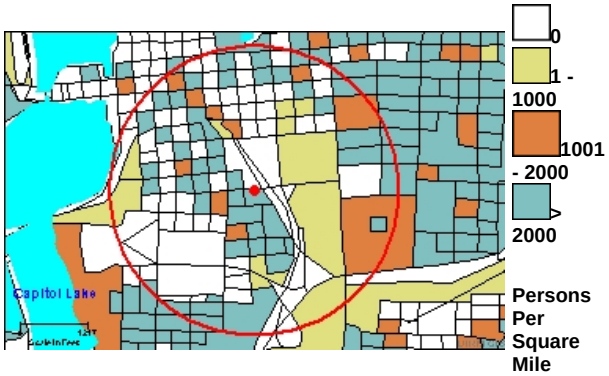
Thurston County

Demographic Statistics Within a Half Mile of the Site*

Total Population	2076
White	1760
Black	66
American Indian, Eskimo, Aleut	48
Asian or Pacific Islander	83
Other Race	28
Hispanic Origin	99
Children Aged 6 and Younger	97
Adults Aged 65 and Older	143
Females Aged 15 - 44	606
Total Aged over 18	1864
Total Aged under 18	211
Total Housing Units	1314

* Calculated using the area proportion technique.
Source: 2000 U.S. CENSUS

Population Density



Children 6 Years and Younger

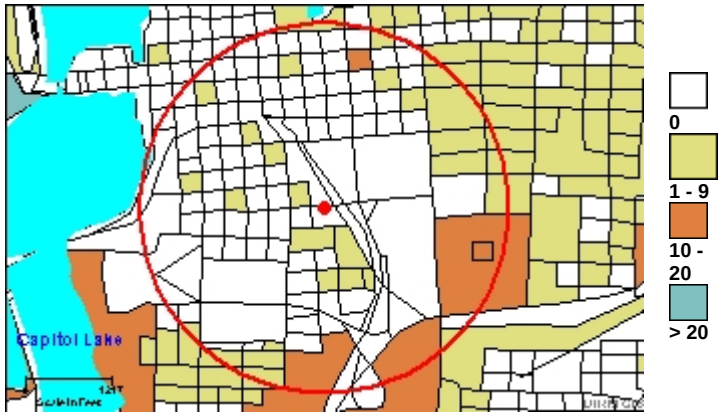


Figure 2. Location of WTSC in relation to TMC Cleaners site. Olympia, Washington.

Certification

This Evaluation of follow-up Indoor Air Sampling Results (March 2007) at the Washington Traffic Safety Commission Offices TMC Cleaners(a/k/a Howard's Cleaners and Olympia Cleaners) Olympia,Washington Public Health Consultation was prepared by the Washington State Department of Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodology and procedures existing at the time the health consultation were initiated. Editorial review was completed by the Cooperative Agreement partner.

Robert B. Knowles, M.S., REHS
Technical Project Officer, CAPEB, DHAC
Agency for Toxic Substances & Disease Registry

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

Alan W. Yarbrough, M.S.
Team Leader, CAPEB, DHAC
Agency for Toxic Substances & Disease Registry

References

[1] Conrex, Inc. Phase II ESA Report of Sampling Activities conducted on the Olympia Drycleaners property, Olympia Washington. June 13, 1995.

[2] Stemen Environmental, Inc. Interim Remedial Activities and Groundwater Monitoring Report: Former Olympia Drycleaners, 606 E. Union Avenue, Olympia, Washington. January 10, 2003.

[3] Washington State Department of Health. Health Consultation: Olympia Drycleaners, Olympia, Thurston County, Washington. June 15, 1999.

[4] Atmospheric Analysis & Consulting, Inc. Laboratory Analysis Report for indoor air samples collected by Gerald Tousley, Thurston County Environmental Health Division. July 31, 2002.

[5] Washington State Department of Health. Health Consultation: Evaluation of Indoor Air Sampling Results (July 16-17, 2002) at the Washington Traffic Safety Commission Offices, Howard's Drycleaners (a/k/a Olympia Drycleaners), Olympia, Thurston County, Washington. September 18, 2003.

[6] Washington State Department of Health. Health Consultation: Evaluation of follow-up Indoor Air Sampling Results at the Washington Traffic Safety Commission Offices, TMC Cleaners (a/k/a Howard's Cleaners and Olympia Drycleaners), Olympia, Thurston County, Washington. March 11, 2005.

[7] Farallon Consulting. Letter report dated March 16, 2007. Indoor Air Sampling Results 1000 Cherry Street Southeast. Olympia, Washington. Farallon PN: 555-001.

[8] Severn Trent Laboratories, Inc. Washington State Indoor Sampling Analytical Report. March 1, 2004.

[9] US Environmental Protection Agency. Guidelines for Carcinogen Risk Assessment (Review Draft). NCEA-F-0644 July 19991999 Jul. Web address: Available at http://www.epa.gov/NCEA/raf/cancer.htm.

[10] Agency for Toxic Substances and Disease Registry. ATSDR Fact Sheet: Cancer. Updated August 30, 2002. Atlanta: US Department of Health and Human Services. Available at internet: http://www.atsdr.cdc.gov/COM/cancer-fs.html.

[11] United States Environmental Protection Agency, Office of Research and Development. Exposure Factors Handbook Volume I: General Factors. EPA/600/P-95/002Fa. August 1997.