From: Schultz, Josie M - DNR
Sent: Thursday, April 21, 2022 12:35 PM
To: 'Rob Hoverman'
Subject: SIWP NTP with comments for Troy Laundry & Cleaners - BRRTS # 02-60-385641
Attachments: DHS TCE letter 20210425.pdf

Hi Rob,

I've reviewed the workplan for Troy Laundry & Cleaners and discussed the proposal for vapor sampling with other regions across the state, along with the statewide vapor team. DNR has not allowed restriction of access to address VAL exceedances, thus additional vapor monitoring would not change the need for mitigation within the basement of 320 Pine Street. Wis Admin Code NR 726.05(8) requires a remedial action along with interruption or mitigation of the vapor exposure pathway prior to closing a site.

I also had conversations with the Department of Health Services, and they have asked that I share DHS' TCE letter to the DNR, which I've attached to this email. Our biggest concern is the acute risk associated with TCE; an EPA study has shown that a single exposure to low levels of TCE can have an acute effect on a developing fetus. Because it would be very difficult to regulate occupancy of the basement, especially if the property were to change hands, we have increased concern of exposure to these TCE vapors.

I have the following comments regarding the rest of the workplan that was submitted:

1. Grabbing 4 hand auger soil samples from the dirt floor portion of the basement seems adequate.
2. Installation of a small diameter monitoring well with pre-packed screen within the basement screened at 2-12' sounds good. I also recommend installing a deeper piezometer, if feasible, as one may be needed in the future if MW-6 is found to be contaminated.
3. I agree with sampling of the entire monitoring well network.
4. It's mentioned that sanitary vapor sampling from the building clean out or vent stacks will be included in additional investigations dependent on results. Because drycleaners were known to discharge to the sanitary, and soil gas sampling around the laterals show vapor contamination, a sanitary sewer investigation is required for the site. Please refer to RR-649, and grab a vapor sample from an upgradient and downgradient sanitary manhole, and an access point closest to the source. With the high vapor concentrations in soil gas samples from near the laterals, its recommended to sample the sanitary clean out(s) and/or vent stack as you had mentioned.

With the comments above, you can accept this email as your notice to proceed with the additional site investigation. Please feel free to reach out if you have any questions or concerns with the comments or decision on active mitigation.

Thanks,
Josie

Josie M. Schultz
Hydrogeologist – Northeast Region Remediation and Redevelopment Team
Wisconsin Department of Natural Resources
2984 Shawano Avenue, Green Bay, WI 54313-6727
Cell Phone: 920-366-5685
Josie.Schultz@Wisconsin.gov


dnr.wi.gov


Tony Evers
Governor

Karen E. Timberlake
Secretary

State of Wisconsin
Department of Health Services

DIVISION OF PUBLIC HEALTH

1 WEST WILSON STREET
PO BOX 2659
MADISON WI 53701-2659

Telephone: 608-266-1251
Fax: 608-267-2832
TTY: 711 or 800-947-3529

March 25, 2021

Christine Haag
Program Director
Remediation and Redevelopment Program
Wisconsin Department of Natural Resources
101 S. Webster Street, P.O. Box 7921
Madison, WI 53707-7921

Subject: DHS response to Request for Assistance: Actions for Trichloroethylene at Acute Risk Levels

Dear Ms. Haag:

The Wisconsin Department of Health Services (DHS) received your letter dated October 18, 2019 requesting clarification on the definition of acute risk and timeline justifications for responding to various scenarios where the acute risk is related to volatile organic compounds (VOCs) and vapor intrusion (VI).

This request for clarification is intended to augment a December 7, 2017 DHS letter to the Wisconsin Department of Natural Resources (DNR) providing recommendations for when immediate action is needed in response to written comments on proposed revisions to the RR-800 document. Specifically, DHS concurred with DNR's position that immediate action is justified when indoor air is found to be present at three (3) times the indoor air vapor action level (VAL) or sub-slab vapor risk screening level (VRSL) for a non-carcinogen or ten (10) times the VAL or VRSL for a carcinogen. In addition, DHS supported the DNR's position that immediate action be taken when trichloroethylene (TCE) is present in indoor air above the VAL and when women of child-bearing age are present.

DHS response:

DHS clarification statements defining acute risk and justifying timelines for responding to acute risk follow for each of the DNR scenarios presented in the request letter:

1. **Clarification from DHS that acute risk necessitates immediate action as defined in s. NR 700.03(28), Wis. Admin. Code.**

   To reinforce the finding in the December 7, 2017 letter, DHS is in agreement that DNR's immediate action as defined in s. NR 700.03(28), Wis. Admin. Code is warranted when acute risk is observed as discussed in DNR's Vapor Intrusion Guidance RR800 (2018). For all contaminants with the exception of trichloroethylene (TCE) when women of childbearing years (age 15 to 44) are present, acute risk is defined as indoor air concentrations that are three times over the vapor action limit (VAL) for non-carcinogens

or ten times over the VAL for carcinogens. For TCE where people who are or may become pregnant occupy a dwelling, acute risk is defined as indoor air concentrations that are equal to or over the VAL (HI $\geq$ 1). These immediate action guidelines are in agreement with EPA guidance. The following statement is from the EPA OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (EPA 2015): "Although the indoor air concentrations may vary temporally, an appropriate exposure concentration estimate (e.g., time-integrated or time-averaged indoor air concentration measurement in an occupied space) that exceeds the health-protective concentration levels for acute or short-term exposure (i.e., generally considered to be a hazard quotient (HQ) greater than one for an acute or short-term exposure period) indicates vapor concentrations that are generally considered to pose an unacceptable human health risk."

2. **Clarification from DHS that trichloroethylene (TCE) present in indoor air above the applicable VAL qualifies as an acute risk to women of child-bearing years.**

DNR basis its VAL and VRSL values on EPA regional screening levels (RSLs) for indoor air. These values are developed using reference concentrations (RfCs) from EPA's toxicological assessments developed for its Integrated Risk Information System (IRIS). The non-cancer chronic inhalation RfC of $2x10^{-3}$ mg/m^3 in EPAs toxicological assessment for TCE (2011) is based upon two rodent drinking water exposure studies. One study (Kiel et al., 2009) reported an immunotoxic effect of TCE presenting as a reduced thymus weight in female mice. The other study reported an increased incidence of fetal cardiac malformations (Johnson et al., 2003). The cardiac malformation developmental endpoint drives the concern over short term exposure to TCE. Although some limitations were reported with the Johnson et al. study (2003), the cardiac malformations finding has been confirmed by several reviews since, including the EPA Office of Solid Waste and Emergency Response (2014), ATSDR (2014), the Massachusetts Department of Environmental Protection (MADEP, 2014), a group of EPA researchers (Makris et al, 2016), and the North Carolina Department of Environmental Quality (NC DEQ, 2018). These reviews found that a two- to three-fold increase in congenital heart defects were observed in multiple animal studies and that the most frequently observed heart defects were also reported in humans exposed to TCE-containing VOCs in several epidemiological studies (Brender et al. 2014, Dawson et al. 1993). These reviews also found that mechanistic support exists with studies in avian and mammalian cells demonstrating that TCE exposure alters processes that are critical to normal valve and septum formation. Although a recent EPA TSCA Risk Evaluation for TCE (2019) used the immunotoxic end point and not the fetal cardiac malformation end point for their risk determinations, the EPA Science Advisory Committee on Chemicals (SACC) was split on whether to use the fetal heart malformations endpoint for risk consideration and the TSCA Risk Evaluation was not allowed to consider epidemiological evidence or the effects of TCE exposure from air, contaminated waste sites, groundwater used for drinking water, and food in their evaluation.

The EPA identifies that a single exposure at any of several developmental stages may be sufficient to produce an adverse developmental effect (EPA, 1991). In humans, the cardiac system is the second to develop following fertilization, with cardiac development beginning at approximately 3 weeks following implantation. Substantial cardiac system development continues through 8 to 9 weeks post implantation, with the most sensitive period of cardiac development occurring in 3 to 6 weeks (Smart and Hodgson, 2018). These critical fetal heart development windows occur during a time period when an individual may not yet know they are pregnant. Rapid actions should be taken to minimize the potential for TCE exposures during these timeframes (EPA 2014, EPA Region V, 2020).

3. **Health-based recommended responses including the definition of critical exposure windows with scientific justification to help inform DNR determination of time lines for immediate (s. NR 700.03(28), Wis. Admin. Code) and interim (s. NR 700.03(29), Wis. Admin. Code) actions in the following scenarios:**

    a. **TCE is present beyond the envelope of a building at or above the applicable Vapor Risk Screening Level (VRSL);**

    DHS recommends an evaluation of the demographics for the building. If persons of childbearing years occupy the dwelling, indoor air samples should have a quick turnaround time (24 to 72 hours, EPA Region 9, 2014). Women in the sensitive demographic should be consulted about the potential TCE developmental toxicity risk so they may make informed decisions in terms of staying in the dwelling during the timeframe of the indoor air assessment. DHS or local health can assist with this consultation. If the indoor air TCE sample result exceeds the VAL, DHS recommends interim action (carbon filter unit) and rapid installation of sub-slab depressurization system within two weeks. If the indoor air TCE sample result is less than the VAL, mitigate and monitor indoor air in interim to ensure exposure is not occurring and move toward installation of a mitigation system within 4 to 8 weeks, depending upon the building's complexity and need for system design.

    b. **Non-carcinogenic compounds are present beyond the envelope of a building at or above three (3) times the applicable VRSL;**

    The U.S. EPA defines a reference concentration (RfC) as an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure of a chemical to the human population through inhalation (including sensitive subpopulations), that is likely to be without an appreciable risk of deleterious effects during a lifetime (IRIS Glossary, 2020). When a non-carcinogenic VOC is three times above the applicable VRSL, the risk of that VOC being present in indoor air at levels that can cause an adverse health effect is high enough to warrant urgent action including indoor air sampling with 24 to 72 hour turnaround time and mitigation within 4 to 8 weeks, or sooner where indoor air sampling results indicates a VAL exceedance.

c. Carcinogenic compounds are present beyond the envelope of a building at or above ten (10) times the applicable VRSL;

VRSLs are established in Wisconsin with a 10^{-5} cancer risk. When a carcinogenic compound is present in indoor air at or above ten times the applicable VRSL, the cancer risk exceeds 10^{-4} cancer risk. The risk of cancer occurrences from continuous exposure is therefore high enough to warrant the installation of a mitigation system within 4 to 8 weeks, depending upon the building's complexity and need for system design.

d. TCE is present in indoor air below the applicable VAL

Review sub-slab results when available. If sub-slab TCE data is also below VRSL, additional assessment should take place with normal laboratory turnaround time to confirm results are below action levels. If women of childbearing years occupy the building, an additional sampling round should take place as soon as feasible to ensure levels above VAL/VRSL is not present.

e. Non-carcinogenic compounds are present in indoor air between the applicable VAL and three (3) times the applicable VAL;

Move toward mitigation system installation within 4 to 8 weeks, depending upon complexity and need for system design. Perform indoor air sampling to confirm mitigation system is effective.

f. Carcinogenic compounds are present in indoor air between the applicable VAL and ten (10) times the applicable VAL;

Move toward mitigation with a recommended timeframe of 4 to 8 weeks, depending upon complexity and need for system design. Perform indoor air sampling to confirm mitigation system is effective.

g. TCE is present in indoor air at or above the applicable VAL;

DHS recommends an evaluation of the demographics for the building. If women of childbearing years occupy the building, implement interim actions such as carbon filtration units to interrupt the TCE exposure. Move toward installation of a mitigation system within two weeks. Women in the sensitive demographic should be consulted about the potential TCE developmental toxicity risk so they may make informed decisions in terms of staying in the dwelling during the timeframe of the indoor air assessment.

h. Non-carcinogenic compounds are present in indoor air at or above three (3) times the applicable VAL;

The U.S. EPA defines a reference concentration (RfC) as an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure of a chemical to the human population through inhalation (including sensitive subpopulations), that is likely to be without an appreciable risk of deleterious effects during a lifetime (IRIS Glossary, 2020). When a non-carcinogenic VOC is three times above the applicable VAL, the risk of adverse health effects occurring from continuous exposure is high enough to warrant the installation of a mitigation system within 4 to 8 weeks, depending upon the building's complexity and need for system design. Depending upon how far above the VAL the concentration is, more urgent actions may be needed, and the local health officer should be consulted for potential abatement orders, placarding, and temporary relocation of occupants per Section 254 Wis. Admin. Code.

i. **Carcinogenic compounds are present in indoor air at or above ten (10) times the applicable VAL.**

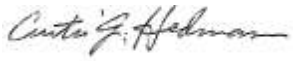
When a carcinogenic compound is present in indoor air at or above ten times the applicable VAL, the cancer risk exceeds 10^{-4} cancer risk. The risk of cancer occurrences from continuous exposure is therefore high enough to warrant the installation of a mitigation system within 4 to 8 weeks, depending upon the building's complexity and need for system design. Depending upon how far above the VAL the concentration is, more urgent actions may be needed, and the local health officer should be consulted for potential abatement orders, placarding, and temporary relocation of occupants per Section 254 Wis. Admin. Code.

4. **Health-based recommendations for when sampling indoor air at commercial or industrial businesses is necessary in light of the recent Department of Defense study on sewers and utility tunnels as preferential pathways (*Sewers and Utility Tunnels as Preferential Pathways for Volatile Organic Compound Migration into Buildings: Risk Factors And Investigation Protocol*, ESTCP Project ER-201505).**

DHS agrees with the finding in the DoD study that indoor air should be part of the VI assessment where evidence of preferential pathways might be feasible. This evidence may include detection of VOCs in sewer lines or utility corridors. Recent experience has shown instances where indoor air levels are found at high levels due to preferential pathway contamination through open sumps, openings in foundations, and poorly sealed conduits. DHS also recommends sampling indoor air when environmental sampling (groundwater, soil, or soil gas) indicates that indoor air action levels could be exceeded. When TCE is the contaminant of concern, indoor air should always be evaluated to assist with the risk assessment and be able to interrupt exposures as soon as possible to sensitive populations to prevent the known reproductive/developmental endpoint. When commercial or industrial businesses are users of the VOCs being studied, those chemicals may need to be temporarily removed prior to the indoor air assessment, where feasible.

Thank you for the opportunity to provide feedback on this topic. Please contact me at (608) 266-6677, or curtis.hedman@wisconsin.gov if you have any follow up questions or comments about this response.

Sincerely,



Curtis Hedman, Ph.D.
Toxicologist
Bureau of Environmental and Occupational Health

Cc: Jennifer Borski, Vapor Intrusion Team Leader, DNR R&R Program
Judy Fassbender, NR Program Manager, DNR R&R Program
Roy Irving, Chief, DHS Hazard Assessment Section, BEOH
Mark Werner, Chief, DHS BEOH

Enc: Summary of DHS response to Request for Assistance: Actions for Trichloroethylene at Acute Risk Levels

References:

WI DNR Remediation and Redevelopment Program Publication RR-800 (2018). *Addressing Vapor Intrusion at Remediation & Redevelopment Sites in Wisconsin*. Available at: https://dnr.wi.gov/files/PDF/pubs/rr/RR800.pdf

U.S. EPA, Office of Solid Waste and Emergency Response, 2015. *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air*. OSWER Publication 9200.2-154 http://www.epa.gov/vaporintrusion/technical-guide-assessing-and-mitigating-vapor-intrusion-pathway-subsurface-vapor

IRIS 2011a. *Trichloroethylene; CASN 79-01-6*. Integrated Risk Information System (IRIS) Chemical Assessment Summary. U.S. Environmental Protection Agency. National Center for Environmental Assessment. Available at: https://cfpub.epa.gov/ncea/iris2/chemicalLanding.cfm?substance_nmbr=199

IRIS 2011b. *Toxicological Review of Trichloroethylene (CAS No. 79-01-6) In Support of Summary Information on the Integrated Risk Information System (IRIS)*. U.S. Environmental Protection Agency, Washington, DC. September 2011. EPA/635/R-09/011F. Available at: https://www.epa.gov/iris/supporting-documents-trichloroethylene

IRIS 2011c. *Toxicological Review of Trichloroethylene Appendices (CAS No. 79-01-6) In Support of Summary Information on the Integrated Risk Information System (IRIS)*. U.S. Environmental Protection Agency, Washington, DC. September 2011. EPA/635/R-09/011F. Available at: https://www.epa.gov/iris/supporting-documents-trichloroethylene

Keil, D; Peden-Adams, M; Wallace, S; Ruiz, P; Gilkeson, G. (2009). *Assessment of trichloroethylene (TCE) exposure in murine strains genetically-prone and non-prone to develop autoimmune disease*. J Environ Sci Health A Tox Hazard Subst Environ Eng 44: 443-453.

Johnson, P; Goldberg, S; Mays, M; Dawson, B. (2003). *Threshold of trichloroethylene contamination in maternal drinking waters affecting fetal heart development in the rat*. Environ Health Perspect 111: 289-292.

U.S. EPA, Office of Solid Waste and Emergency Response, 2014. *Compilation of Information Relating to Early/Interim Actions at Superfund Sites and The TCE IRIS Assessment.* https://clu-in.org/download/contaminantfocus/tce/TCE-compilation-final-2014.pdf

ATSDR (2019) Agency for Toxic Substances and Disease Registry (ATSDR). 2019. *Toxicological profile for Trichloroethylene (TCE)*. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

(MADEP, 2014) MADEP, 2014. *Assessing the Congenital Cardiac Toxicity of Trichloroethylene: Key Scientific Issues*. Massachusetts Department of Environmental Protection Office of Research and Standards. March 2014.

Wikipedia The Free Encyclopedia. Trichloroethylene, available at: https://en.wikipedia.org/wiki/Trichloroethylene

(Makris et al, 2016) Makris et al., 2016. *A Systemic Evaluation of the Potential Effects of Trichloroethylene Exposure on Cardiac Development*. Reproductive Toxicology. 2016, 65:321-358. August 2016. http://dx.doi.org/10.1016/j.reprotox.2016.08.014

NC Department of Environmental Quality Report to the Secretaries' Science Advisory Board (2018). *Trichloroethylene (TCE) Inhalation Immediate Action Levels and Response Guidance for Indoor Air Protective of Cardiac Developmental Defects*. Available at: https://files.nc.gov/ncdeq/GenX/SAB/DEQ-TCE-IA-AL-Report-101518.pdf

Brender et al., 2014. *Maternal Residential Proximity to Chlorinated Solvent Emissions and Birth Defects in Offspring: A Case–Control Study*. Environmental Health 2014, 13:96.

Dawson et al., 1993. Dawson, B., Johnson, P., Goldberg, S., Ulreich, J. *Cardiac teratogenesis of halogenated hydrocarbon-contaminated drinking water*, J. Am. Coll. Cardiol.21 (1993) 1466–1472, http://dx.doi.org/10.1016/0735-1097(93)90325-U .

U.S. EPA 1991b. U.S. Environmental Protection Agency. *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decis*ions. OSWER Directive 9355.0-30.

Smart and Hodgson, 2018. *Molecular and Biochemical Toxicology*. Edited by Smart, Robert C.; Hodgson, Ernest, North Carolina State University, Raleigh, NC, USA. Wiley & Sons, Inc. Hoboken, NJ.

U.S. EPA Region 5 (2020). Superfund and Emergency Management Division Vapor Intrusion Handbook.

U.S. EPA *IRIS Glossary*. Terminology Services (TS). U.S. Environmental Protection Agency, Washington, DC. Available at: https://iaspub.epa.gov/sor_internet/registry/termreg/searchandretrieve/termsandacronyms/search.do

US DOD (2018). *Sewers and Utility Tunnels as Preferential Pathways for Volatile Organic Compound Migration into Buildings: Risk Factors and Investigation Protocol*, ESTCP Project ER-201505

Enclosure: Summary of DHS response to Request for Assistance: Actions for Trichloroethylene at Acute Risk Levels

DNR Ask	DHS Response	Supporting Reference(s)
1) Clarification from DHS that acute risk necessitates immediate action as defined in s. NR 700.03(28), Wis. Admin. Code.	**A)** Immediate action as defined in NR 700.03(28) warranted if: for compounds except TCE = 3x VAL, or 10x VAL carcinogens; TCE w/ women age 15-44 = VAL	**A)** December 7, 2017 DHS letter and EPA OSWER Tech Guide (2015)
2) Clarification from DHS that trichloroethylene (TCE) present in indoor air above the applicable VAL qualifies as an acute risk to women of child-bearing years	**A)** VALs&VRSLs based on EPA RSLs **B)** RSL for TCE is based on immunotox. and fetal cardiac development endpoints **C)** findings confirmed by reviews **D)** also consistent with epi study findings **E)** single exposure during development can have harmful effect **F)** critical development window 3 to 6 weeks **G)** rapid action warranted for TCE > RSL	**A)** EPA tox assessment TCE (2011) **B)** Kiel et al. (2009) Johnson et al. (2003) **C)**EPA OSWER (2014), ATSDR (2014), MADEP (2014), Makris et al (2016), NC DEQ (2018) **D)**Brender et al. (2014), Dawson et al. (1993) **E)**EPA (1991) **F)** Smart and Hodgson (2018) **G)** EPA 2014, EPA Region V (2020)
3) Health-based recommended responses including the definition of critical exposure windows with scientific justification to help inform DNR determination of time lines for immediate (s. NR 700.03(28), Wis. Admin. Code) and interim (s. NR 700.03(29), Wis. Admin. Code) actions in the following scenarios:		
a) TCE is present beyond the envelope of a building at or above the applicable Vapor Risk Screening Level (VRSL)	**A)** evaluate demographics in building **B)** sample indoor air with 24-72 hour TAT **C)** consult w/ women 15-44 about TCE **D)** if TCE >VAL, carbon filtration w/in 48 hours and sub-slab system w/in 2 weeks **E)** if TCE <VAL, perform another indoor air sample and sub-slab system w/in 4-8 weeks	**B)** EPA Region 9, (2014) WI DNR RR800 (2018), EPA Reg V (2020)
b) Non-carcinogenic compounds are present beyond the envelope of a building at or above three (3) times the applicable VRSL	**A)** RfC is estimate, ca. order of magnitude, of concentration w/o harm over lifetime **B)** >3x that level cuts significantly into that safety factor **C)** indoor air sampling with 24-72 hour TAT **D)** sub-slab system w/in 4-8 weeks if >VAL	**C)** EPA Region 9, (2014) WI DNR RR800 (2018), EPA Reg V (2020)
c) Carcinogenic compounds are	**A)** VRSLs est. w/ 10^{-5} cancer risk	WI DNR RR800 (2018), EPA Reg. V (2020)

present beyond the envelope of a building at or above ten (10) times the applicable VRSL	**B)** >10x that exceeds 10^{-4} cancer risk **C)** sub-slab system w/in 4-8 weeks if >10x VRSL	
d) TCE is present in indoor air below the applicable VAL	**A)** verify TCE in sub-slab is not >VRSL **B)** If TCE also <VRSL; one more sampling event **C)** do follow up samples soon as possible if women age 15-44 live in building	WI DNR RR800 (2018), EPA Reg. V (2020)
e) Non-carcinogenic compounds are present in indoor air between the applicable VAL and three (3) times the applicable VAL	**A)** sub-slab system w/in 4-8 weeks **B)** sample to confirm system is effective	WI DNR RR800 (2018), EPA Reg. V (2020)
f) Carcinogenic compounds are present in indoor air between the applicable VAL and ten (10) times the applicable VAL	**A)** sub-slab system w/in 4-8 weeks **B)** sample to confirm system is effective	WI DNR RR800 (2018), EPA Reg. V (2020)
g) TCE is present in indoor air at or above the applicable VAL	**A)** evaluate demographics in building **B)** consult w/ women 15-44 about TCE **C)** carbon filtration w/in 48 hours and sub-slab system w/in 2 weeks	WI DNR RR800 (2018), EPA Reg. V (2020)
h) Non-carcinogenic compounds are present in indoor air at or above three (3) times the applicable VAL	**A)** RfC is estimate, ca. order of magnitude, of concentration w/o harm over lifetime **B)** >3x that level cuts significantly into that safety factor **C)** sub-slab system w/in 4-8 weeks **D)** if >>VAL, consult health officer for actions available under Section 254 WI Administrative Code	WI DNR RR800 (2018), EPA Reg. V (2020)
i) Carcinogenic compounds are present in indoor air at or above ten (10)	**A)** VRSLs est. w/ 10^{-5} cancer risk **B)** >10x that exceeds 10^{-4} cancer risk **C)** sub-slab system w/in 4-8 weeks	WI DNR RR800 (2018), EPA Reg. V (2020)

times the applicable VAL	**D)** if >>VAL, consult health officer for actions available under Section 254 WI Administrative Code	
4) Health-based recommendations for when sampling indoor air at commercial or industrial businesses is necessary in light of the recent Department of Defense study on sewers and utility tunnels as preferential pathways (*Sewers and Utility Tunnels as Preferential Pathways for Volatile Organic Compound Migration into Buildings: Risk Factors And Investigation Protocol*, ESTCP Project ER-201505)	**A)** DHS agrees with DOD study findings **B)** DHS recommends sampling indoor air when soil gas results suggest indoor air levels may be exceeded **C)** Indoor air should always be assessed where TCE is contaminant of concern due to acute reproductive endpoint **D)** when assessing indoor air in commercial buildings, may need to relocate COCs that are used in production during sampling	US DOD ESTCP Project ER-201505 (2018)