

Letter Health Consultation

HENRY'S DRY CLEANERS

LACONIA, NEW HAMPSHIRE

**Prepared by
New Hampshire Department of Environmental Services**

FEBRUARY 13, 2013

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners 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.

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LETTER HEALTH CONSULTATION

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STATE OF NEW HAMPSHIRE
Department of Environmental Services
Air Resources Division

Memorandum

Date: January 29, 2013
To: Janis Tsang, U.S. Environmental Protection Agency, Region I
From: David S. Gordon, Environmental Health Program *David S. Gordon*
Re: Vapor Intrusion Evaluation of Indoor Air and Soil Gas Samples Collected on March 20th and 21st, 2012 from the Beacon Street West Condominium Complex (BSWC), Henry's Dry Cleaners, and Goodwill Store, Laconia, NH

Per your request, the New Hampshire Department of Environmental Services (DES) Environmental Health Program (EHP) has reviewed the analytical results of air samples collected on March 20 and 21, 2012 in Laconia, NH, (1) to determine if contaminants pose a hazard to building occupants..

Background and Statement of Issues

Indoor air samples were collected from residential units at the Beacon Street West Condominiums (BSWC), also known as the former Allen-Rogers Mill. Samples were collected from condominiums in two buildings: 1) Building 6, which has a vapor intrusion (VI) mitigation system in operation since July 2007; and 2) Building 8, which does not have a VI mitigation system because previous investigations indicated that the chlorinated volatile organic compound (CVOC) groundwater contaminant plume had not impacted this building (2,3). Refer to Figure 1-Site Map for building locations. Building 3 is also located on BSWC property. It is a vacant former Mill building, which is under consideration for conversion to residential or commercial use based on DES discussions with the BSWC Developer (3). Previous Site investigations and the most recent one confirm that a well-defined groundwater contaminant plume extends under Buildings 6 and 3. Based on groundwater data compiled from the investigations, DES has determined that contamination beneath BSWC originates off-site, most likely from the north-northeast (4).

A total of 24 subslab soil gas grab samples were collected beneath basements in BSWC buildings 3, 6, and 8 and two businesses northeast of Building 6 across Beacon Street: Henry's Dry Cleaners (Henry's) and a Goodwill Industries Store (Goodwill). Henry's has been in operation in that location since 1969 and the building reportedly housed a dry cleaning business previous to Henry's ownership (5). Contaminants detected at BSWC have also been detected in soil and groundwater on/under the Henry's property at concentrations exceeding State regulatory standards (6).

Indoor air samples were collected from Building 6 and 8 residences located on all three floors of the condominiums for 24 hours with SUMMA® canisters; subsurface soil gas grab samples were collected with Tedlar® Bags. Samples were analyzed for six contaminants: tetrachloroethylene (PCE), the dry cleaning solvent used at Henry's since they became the owners (6); trichloroethylene (TCE); 1,1-

dichloroethylene (1,1-DCE); cis- and trans-1,2-dichloroethylene (cis- and trans-1,2-DCE); and vinyl chloride (VCL). TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride are all potential environmental breakdown products of PCE (7). Precise locations of the indoor air samples in the residences and the soil gas samples in the buildings are depicted in the Lockheed Martin-Scientific Engineering Response and Analytical Services (SERAS) Report dated May 15, 2012 (1).

Discussion

Exposure Pathways

Vapor intrusion (VI), the migration of contaminant vapors from groundwater, soil, or nonaqueous phase liquid (NAPL) through the subsurface and into the indoor air of a building, is the only pathway of concern at the Site. There are no private or public drinking water wells in the area. Buildings or asphalt cover most of the soil at BSWC and the businesses.

NH VI Screening Values

NH DES VI Screening Levels are derived to be protective against the most sensitive non-cancer health effect or an excess lifetime cancer risk (ELCR) of one-in-one million (8). For contaminants with both cancer and non-cancer effects, the more protective value is chosen as the screening value (8). Screening values have been developed to evaluate both residential and commercial (occupational) exposures. NH DES Screening Levels for Residential Indoor Air, Residential Soil Gas, and Commercial Soil Gas for the contaminants of concern are presented in Table 1A.

The general equation used to calculate soil gas screening values used by NH is as follows:

$$SG = C_{air}/\alpha SG$$

Where:

SG = soil gas screening value in $\mu\text{g}/\text{m}^3$

C_{air} = indoor air screening value for the appropriate exposure scenario in $\mu\text{g}/\text{m}^3$

αSG = soil gas-to-indoor air attenuation factor (AF) of 0.02 (**i.e., there is an estimated fifty fold reduction in the concentration of contaminants in the soil gas to the concentration in the indoor air.**) (8)

ATSDR Comparison Values

ATSDR Comparison Values (CVs) are media-specific concentrations used to identify contaminants that require additional evaluation. CVs are derived using standard default exposure assumptions and are not site-specific. For contaminants detected below their respective CVs, exposure is not anticipated to result in adverse health effects. For inhalation exposure, non-cancer health effects are evaluated with either Environmental Media Exposure Guides (EMEGs) or Minimal Risk Levels (MRLs) and cancerous effects with Cancer Risk Evaluation Guides (CREGs). CVs for the contaminants of concern are presented in Table 1B. *The most protective value of the NH VI screening values and ATSDR CVs was used to evaluate indoor air concentrations.*

Choices of action that can be taken at VI sites include no further action, continued monitoring, or mitigation. A decision on which action is most appropriate is guided, in part, by combinations of indoor air sample results, soil gas sample results, and the magnitude of any exceedances (Table 2). Other factors taken into consideration when deciding on a course of action at a VI site include the type and location of the contaminant source, costs of mitigation vs. monitoring, potential future site use, and cumulative risk, when multiple contaminants of concern are present (8).

Indoor Air Results

Results of indoor air samples collected from the condominium units and their comparison to Residential Indoor Air Screening Values are presented in Table 3. PCE was the only contaminant detected. The maximum detected concentration of 5.22 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) is below the NH PCE screening value of $8 \mu\text{g}/\text{m}^3$. However, the two samples collected from Unit 7 (5.22 and $5.09 \mu\text{g}/\text{m}^3$) and the sample from Unit 8 ($4.68 \mu\text{g}/\text{m}^3$) exceed the PCE CREG) of $3.8 \mu\text{g}/\text{m}^3$.

Because the CREG for PCE was exceeded by three indoor air samples from two separate units in the condominiums, the cancer risk for an adult resident was calculated. Excess lifetime cancer risk (ELCR) for inhalation exposure can be calculated with the following equation:

$$\text{ELCR} = (C_{\text{air}} \times \text{ED}/\text{AT}) \times \text{IUR}$$

Where,

C_{air} = contaminant concentration in air ($5.22 \mu\text{g}/\text{m}^3$)
ED = exposure duration for residential exposure (30 years)
AT = averaging time for carcinogenic effects (70 years)
IUR = EPA's Inhalation Unit Risk ($2.6\text{E}-7 \mu\text{g}/\text{m}^3$)⁻¹

Assuming a continuous exposure for the 30 year exposure duration at the maximum detected concentration of PCE in indoor air, the estimated lifetime excess cancer risk for a condominium resident is 5.8 excess cases of cancer for every ten million persons exposed, which is a very low risk. This maximum detected PCE concentration is also below its MRL. Therefore, non-cancer health effects to condominium residents from PCE exposure are not anticipated.

Soil Gas Results

Soil gas results collected from the BSWC condominium buildings 6 and 8, the vacant building 3 and their comparison to Residential Soil Gas Screening Values are presented in Table 4. In one sample out of the 14 collected from beneath the BSWC buildings, PCE and TCE exceeded their screening values. This was in Building 6, which has the VI mitigation system.

Soil gas sample results for the two businesses, Henry's and Goodwill, and their comparison to Commercial Soil Gas Screening Values are presented in Table 5. One or more of the PCE and TCE soil gas concentrations exceeded screening values at Henry's, including PCE concentrations in two samples by greater than one order of magnitude. PCE, TCE, and cis-1,2-DCE soil gas concentrations at the Goodwill Store each exceeded their screening values by greater than one order of magnitude.

Theoretical Indoor Air Contaminant Concentrations in Henry's and Goodwill

While DES VI policy uses an AF of 0.02, EPA VI draft guidance recommends AFs of 0.1 and 0.01 for soil gas samples taken from less than five feet below the foundation level and for samples taken from greater than five feet below the foundation level, respectively (9). All soil gas samples being evaluated for this Health Consult were collected at a depth of less than five feet below the foundation (10). To be protective, the contaminant soil gas concentrations from Henry's and Goodwill were converted to theoretical indoor air concentrations using the EPA AF of 0.1. See Table 6. Theoretical indoor air contaminant concentrations at Henry's and Goodwill would be 5-fold lower if NH VI guidance was followed.

Public Health Implications

Based on the predicted indoor air contaminant concentrations from subslab results, the maximum estimated indoor air PCE concentration (Table 6) in Henry's (8,813.6 $\mu\text{g}/\text{m}^3$) exceeded its chronic inhalation Minimal Risk Level (MRL) by about 33-fold and its Cancer Risk Evaluation Guide (CREG) by about 2,300-fold. The maximum estimated TCE concentration in Henry's (43.5 $\mu\text{g}/\text{m}^3$) exceeded its RfC by about 22-fold and its CREG by about 180-fold. For Goodwill, the estimated PCE concentration (14,237.2 $\mu\text{g}/\text{m}^3$) exceeded its MRL by about 53-fold and its CREG by about 3,750-fold. The estimated TCE concentration in Goodwill (590.9 $\mu\text{g}/\text{m}^3$) exceeded its RfC by about 300-fold and its CREG by about 2,460-fold. The estimated cis-1,2-DCE concentration in Goodwill (3,051.6 $\mu\text{g}/\text{m}^3$) exceeded its MRL by about 4-fold

Based on an animal study, EPA has concluded that there is a 1% risk of fetal heart malformations if pregnant women are exposed to TCE in air at 21 $\mu\text{g}/\text{m}^3$, a modeled estimate (11). The estimated concentration of TCE in indoor air at Goodwill exceeds this non-cancer health outcome effect level by about 28-fold.

Although EHP is comparing estimated PCE and TCE indoor air concentrations for occupationally-exposed receptors to health-based values developed for continuous exposure, some of the estimated exposures exceed non-cancer guidelines by large margins. This is a concern. For TCE specifically, the TCE RfC of 2 $\mu\text{g}/\text{m}^3$ and the 21 $\mu\text{g}/\text{m}^3$ effect level for fetal cardiac malformations are based on an effect from a short-duration exposure during pregnancy. It is appropriate to compare these TCE non-cancer health-based values to occupational exposures because workers include women of child-bearing age.

In addition, the exceedances of CREGs ranged from 53- to 2,300-fold and from 180- to 2,460-fold for estimated indoor air concentrations of PCE and TCE, respectively, in Henry's and Goodwill are a concern. Epidemiology studies have shown an association between PCE exposure and increases in bladder, non-Hodgkin's Lymphoma (NHL), and multiple myeloma (7). Epidemiology studies link TCE exposure to increases in kidney cancer, liver cancer, and NHL (11).

PCE detected in indoor air samples in the condominiums was below its State screening value. However, PCE in three samples from two condominium units exceeded its CREG. The ELCR for a condominium resident at the maximum detected PCE concentration in indoor air is 5.8 excess cases of cancer for every ten million persons exposed-- a very low risk. The maximum detected PCE concentration is below its MRL. Therefore, non-cancer health effects to condominium residents from PCE exposure are not anticipated. However, periodic sampling is recommended since contaminant concentrations in the groundwater plume and building conditions affecting VI likely change over time.

Although PCE residential soil gas screening values were exceeded in one soil gas sample from condominium Building 6, the VI mitigation system is presumably reducing contaminant migration from soil gas to indoor air. To confirm the mitigation system effectiveness, air samples were collected from three system exhaust ports. PCE concentrations in the exhaust air were 24,372; 4,231; and 285 $\mu\text{g}/\text{m}^3$ (1). TCE, 1,1-DCE, cis-1,2-DCE, and trans-1,2-DCE were also detected in the exhaust air samples as well. The exhaust ports are located on the roof of the building and vent directly above them into the air. Therefore, people living in the condominiums are not likely to be exposed. The safety of the public from exposure to the vented contaminants was confirmed by extensive ambient air sampling conducted in the vicinity of the Site by the EPA Trace Atmospheric Gas Analyzer bus.

A groundwater contaminant plume originating off-site exists beneath BSWC Buildings 6 and 3. Because

evidence suggests PCE in groundwater may take several decades to degrade (7), it is likely that the migration of contaminants toward the Condominiums will continue for many years. Currently, indoor air contaminant concentrations in buildings 3 and 8 are below levels of health concern. However, if the contaminant plume changes over time as it continues to migrate to BSWC, vapor intrusion into BSWC buildings could become more significant.

Concentrations of contaminants in soil gas at Henry's and Goodwill suggest that elevated concentrations of PCE, TCE and cis-1,2-DCE could migrate to indoor air. Indoor air sampling at the two businesses should be conducted to determine actual exposures. Alternatively, according to NH VI policy, actions can be taken to mitigate potential exposure based on the soil gas exceedances alone.

Conclusions & Recommendations

Indoor air contaminant concentrations for the PCE detected in the BSWC condo units were below levels of health concern. However, because PCE degrades very slowly in groundwater, contaminated groundwater is expected to continue to migrate toward the BSWC property for many years. Therefore, the VI mitigation system in Building 6 should remain operational to ensure indoor air contaminant concentrations remain low. Because of the likely continued migration of the groundwater contaminant plume in the direction of the BSWC, the contaminants detected in soil gas from beneath the condominiums, and the detections of PCE in condominium indoor air, EHP suggests conducting additional indoor air sampling in all inhabited BSWC buildings to determine seasonal variation and provide a stronger basis to confirm that indoor air contaminant levels will remain low.

Because the estimated indoor air contaminant concentrations (based on subslab results) exceed health-based comparison, further action is necessary in the Henry's and Goodwill buildings. EPA made the decision to initially conduct indoor air sampling at Goodwill, which occurred on October 22, 2012. EHP will evaluate the Goodwill sample results, while EPA and DES Regulators evaluate their options for additional remedial actions to reduce exposures.

CC:

Ralph Wickson, DES-WMD, HWRB via email
John Regan, DES-WMD, HWRB via email
Robin Mongeon, DES-WMD, HWRB via email
Dennis Pinski, DES-ARD, EHP via email
David Larson, DES-ARD, EHP via email

References

1. Lockheed Martin. 2012. *Henry's Dry Cleaners Site, Laconia, New Hampshire. Work Assignment #0-167 - Trip Report*. Scientific Engineering Response and Analytical Services (SERAS). May 15, 2012.
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3. NH DES. 2012. Personal Communication with Ralph Wickson, DES Site Manager of Former Allen Rogers Mill (FARM). June 15, 2012.
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Appendix A
Figures

Figure 1: Site Building Locations of the Beacon Street West Condominium Complex (BSWC), Henry's Dry Cleaners, and Goodwill Industries

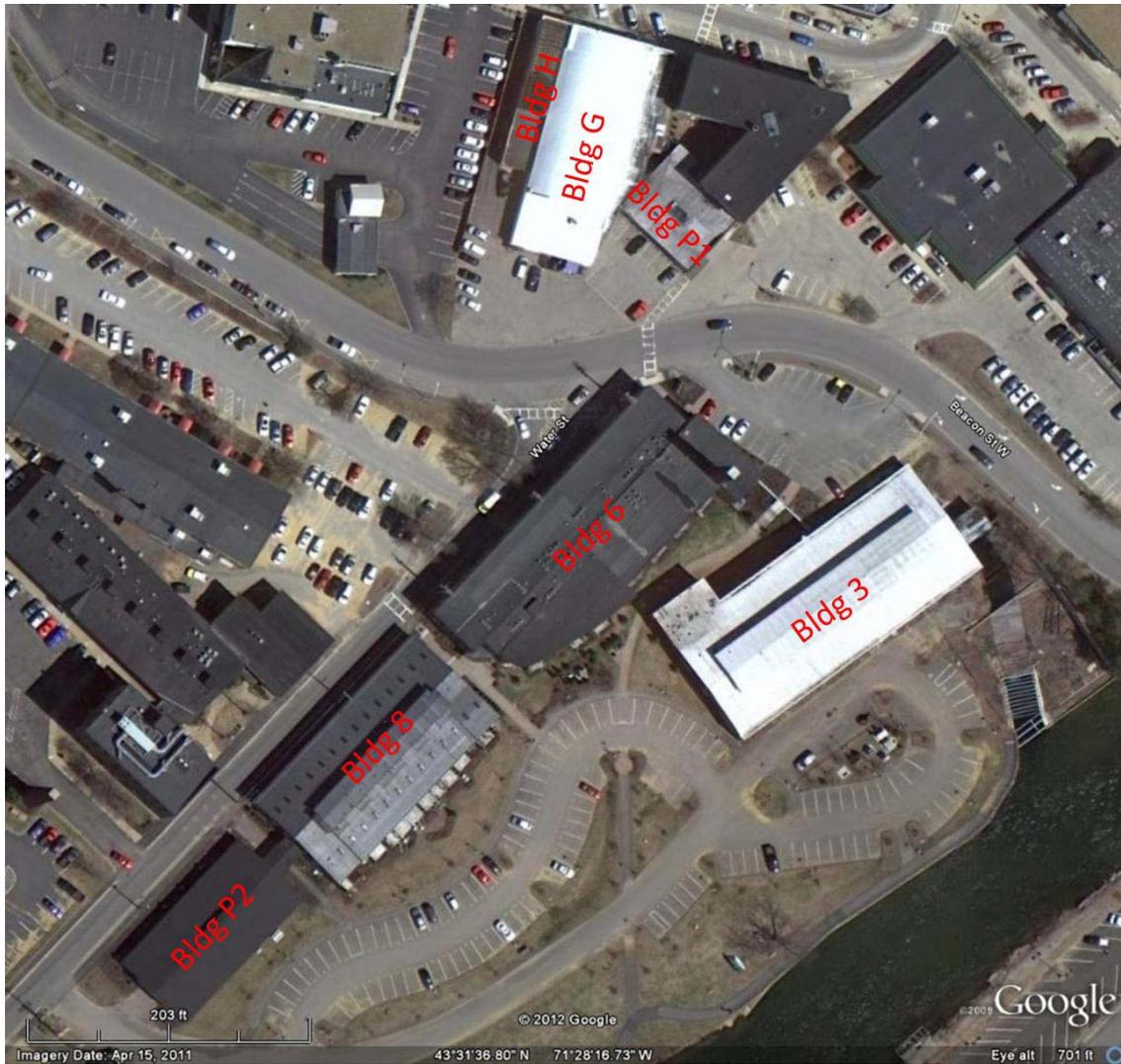


Figure 1:
Site Buildings

Buildings 6 and 8 are Beacon Street West condominiums. Building 3 is a vacant former mill building at BSWC. Building H is Henry's Dry Cleaners. Building G is Goodwill Industries. Buildings P1 and P2 are parking garages.

Appendix B
Tables

Table 1A: NH Department of Environmental Services
Vapor Intrusion Screening Levels for Contaminants of Potential Concern

Table 1B: ATSDR Comparison Values for Contaminants of Potential Concern

Table 2: NH DES Vapor Intrusion Mitigation Decision Criteria

Table 3: Indoor Air Sample Results at the Beacon Street West Condominiums (BSWC)

Table 4: Subslab Soil Gas Sample Results at BSWC Buildings and Comparison to Residential Soil Gas
Screening Levels

Table 5: Subslab Soil Gas Sample Results at Henry's and Goodwill and Comparison to Commercial Soil
Gas Screening Levels

Table 6: Conversion of Subslab Soil Gas Concentrations to Theoretical Indoor Air Concentrations and
Comparison to Air Health Comparison Values: Henry's Dry Cleaners and Goodwill Industries Store

Table 1A
NH Department of Environmental Services
Vapor Intrusion Screening Levels for Contaminants of Potential Concern
 Concentrations are in $\mu\text{g}/\text{m}^3$

Chemical	Residential Indoor Air Screening Levels	Residential Soil Gas Screening Levels	Commercial Indoor Air Screening Levels	Commercial Soil Gas Screening Levels
Tetrachloroethylene (PCE)	8	400	35	1,750
Trichloroethylene (TCE)	0.4	20	1.75	90
1,1-Dichloroethylene (1,1-DCE)	40	200	175	8,800
Cis-1,2-Dichloroethylene (cis-1,2-DCE)*	12	600	53	2,650
Trans-1,2-Dichloroethylene (trans-1,2-DCE)	12	600	53	2,650
Vinyl chloride	0.5	26	2.8	140

*trans-1,2-DCE screening values used as surrogates

Ref: NH DES. 2006. Vapor Intrusion Guidance. Site Remediation Programs, Waste Management Division, New Hampshire Department of Environmental Services. July 2006. Revised July 2011. Available at: http://des.nh.gov/organization/divisions/waste/hwrp/sss/hwrp/guidance_documents.htm.

Table 1B
ATSDR Comparison Values for Contaminants of Potential Concern
 Concentrations are in $\mu\text{g}/\text{m}^3$

Chemical	RfC or MRL	CREG
Tetrachloroethylene (PCE)	270	3.8
Trichloroethylene (TCE)	2 ^a	0.24
1,1-Dichloroethylene (1,1-DCE)	79 ^b	None
Cis-1,2-Dichloroethylene (cis-1,2-DCE)	790 ^c	None
Trans-1,2-Dichloroethylene (trans-1,2-DCE)	790 ^b	None
Vinyl chloride	77 ^b	0.11

a RfC.

b Chemical does not have a chronic inhalation MRL. The intermediate inhalation MRL was used as a surrogate.

c Trans-1,2-DCE value used as a surrogate

ATSDR. 2012. Comparison Values Tables. Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry. Updated August, 2012.



Table 2 - Vapor Intrusion Mitigation Decision Criteria
July 2011

	Indoor Air Concentrations		
	<IASL	>IASL to 10 x IASL	> 10 x IASL
<SGSL	No Action	Repeat sampling; evaluate potential background sources; No Action	Repeat sampling; evaluate potential background sources; No Action
>SGSL to 10 x SGSL	No Action or Monitor	Monitor or Mitigate	Investigate further or Mitigate
>10 x SGSL	Monitor or Mitigate	Monitor or Mitigate	Mitigate

NOTES:

IASL: Indoor Air Screening Level
SGSL: Soil Gas Screening Level

- Investigators should consider the potential for vadose zone (soil) contamination and/or preferential pathways as well as potential background sources as part of the assessment of vapor intrusion.
- Investigators should provide DES with supporting justification to support a “no action” decision where indoor air screening criteria are exceeded and background sources are the cause.
- Investigators should use professional judgment when determining which action is appropriate for a particular structure. Factors to consider include but are not limited to:
 - the relative exceedance of the screening level;
 - the type and location of the source (vadose zone, groundwater, soil);
 - the expected time frame to meet remediation cleanup goals;
 - possible background sources of contamination;
 - the cost to mitigate vs. costs of long term monitoring;
 - the ratio of the sub-slab soil gas and indoor air results; and
 - building construction and current and future use.
- Where more than one chemical of concern (COC) is present in indoor air, the decision of no action, monitor or mitigate should take into consideration cumulative risk calculations based on a site specific risk assessment using site specific exposure factors.

Ref: NH DES. 2006. Vapor Intrusion Guidance. Site Remediation Programs, Waste Management Division, New Hampshire Department of Environmental Services. July 2006. Revised July 2011. Available at: http://des.nh.gov/organization/divisions/waste/hwrb/sss/hwrb/guidance_documents.htm.

Table 3
Indoor Air Sample Results at the Beacon Street West Condominiums (BSWC)
March 20 and 21, 2012
Concentrations are in $\mu\text{g}/\text{m}^3$

Sample No.	Location	Sub Location	PCE	TCE	1,1-DCE	Cis-1,2-DCE	trans-1,2-DCE	VCL
167-001	Unit006	1A1	1.90	ND	ND	ND	ND	ND
167-002	Unit002	1A1	0.43	ND	ND	ND	ND	ND
167-003	Unit003	1A1	0.64	ND	ND	ND	ND	ND
167-004	Unit005	1A1	0.88	ND	ND	ND	ND	ND
167-005	Unit005	1A2	0.81	ND	ND	ND	ND	ND
167-006	Unit004	1A1	0.95	ND	ND	ND	ND	ND
167-007	Unit001	1A1	0.33	ND	ND	ND	ND	ND
167-008	Unit007	1A1	5.09	ND	ND	ND	ND	ND
167-009	Unit007	1A2	5.22	ND	ND	ND	ND	ND
167-010	Unit010	1A1	0.88	ND	ND	ND	ND	ND
167-011	Unit009	1A1	0.60	ND	ND	ND	ND	ND
167-012	Unit008	1A1	4.68	ND	ND	ND	ND	ND
167-013	Unit011	1A1	0.41	ND	ND	ND	ND	ND
167-014	Unit012	1A1	0.29	ND	ND	ND	ND	ND

Bold concentrations exceed an air screening value

ND = Not detected

PCE NH Residential Indoor Air Screening Level = $8 \mu\text{g}/\text{m}^3$

PCE ATSDR Comparison Values: MRL = $270 \mu\text{g}/\text{m}^3$; CREG = $3.8 \mu\text{g}/\text{m}^3$

PCE Screening Level Refs.: NH DES. 2006. Vapor Intrusion Guidance. Site Remediation Programs, Waste Management Division, New Hampshire Department of Environmental Services. July 2006.

Revised July 2011. Available at:

http://des.nh.gov/organization/divisions/waste/hwrb/sss/hwrb/guidance_documents.htm.

ATSDR. 2012. Comparison Values Tables. Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry. Updated August, 2012.

Table 4
Subslab Soil Gas Sample Results at BSWC Buildings and Comparison to Residential Soil
Gas Screening Levels
March 20 and 21, 2012
Concentrations are in $\mu\text{g}/\text{m}^3$

Sample No.	Location	Sub Location	PCE	TCE	1,1-DCE	Cis-1,2-DCE	trans-1,2-DCE	VCL
51100.00	BLDG 6	SS-01	17.6	ND	ND	ND	ND	ND
51101.00	BLDG 6	SS-02	8.8	ND	ND	ND	ND	ND
51102.00	BLDG 6	SS-03	1898.3	214.9	ND	55.5	2.6	ND
51103.00	BLDG 6	SS-04	74.6	ND	ND	ND	ND	ND
51104.00	BLDG 8	SS-01	74.6	ND	ND	ND	ND	ND
51105.00	BLDG 8	SS-02	39.3	ND	ND	ND	ND	ND
51106.00	BLDG 8	SS-03	7.5	ND	ND	ND	ND	ND
51113.00	BLDG 3	SS-1-01	4.1	ND	ND	ND	ND	ND
51114.00	BLDG 3	SS-1-02	ND	ND	ND	ND	ND	ND
51115.00	BLDG 3	SS-1-03	10.2	ND	ND	ND	ND	ND
51116.00	BLDG 3	SS-2-01	ND	ND	ND	ND	ND	ND
51117.00	BLDG 3	SS-2-02	ND	ND	ND	ND	ND	ND
51118.00	BLDG 3	SS-2-03	ND	ND	ND	ND	ND	ND
51119.00	BLDG 3	SS-2-04	ND	ND	ND	ND	ND	ND

Bold values exceed residential soil gas screening value

Bold and shaded values exceed residential soil gas screening value by greater than 10X

ND = Not detected

Buildings 6 and 8 are currently occupied residential units. Building 6 has a VI mitigation system that was operating during the sample event. Building 3 is vacant. The BSWC Developer has discussed converting Building 3 to residential or commercial use. However, there is no official proposal for conversion.

Ref: NH DES. 2006. Vapor Intrusion Guidance. Site Remediation Programs, Waste Management Division, New Hampshire Department of Environmental Services. July 2006. Revised July 2011. Available at: http://des.nh.gov/organization/divisions/waste/hwrb/sss/hwrp/guidance_documents.htm.

Table 5
Subslab Soil Gas Sample Results at Henry's and Goodwill and Comparison to Commercial Soil Gas
Screening Levels
March 20 and 21, 2012
Concentrations are in $\mu\text{g}/\text{m}^3$

Sample No.	Location	Sub Location	PCE	TCE	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	VCL
51107.00	Henry's	SS-01	88,135.3	408.2	ND	51.5	2.8	ND
51108.00	Henry's	SS-02	32,542.3	435.1	ND	396.3	3.6	ND
51109.00	Henry's	SS-03	5,898.3	408.2	ND	2,140.1	24.6	ND
51110.00	Goodwill	SS-01	142,372.4	5908.8	33.3	30,515.7	51.5	ND

ND = Not detected

Results in bold exceed commercial soil gas screening values

Bold and shaded results exceed commercial soil gas screening values by greater than 10X

Ref: NH DES. 2006. Vapor Intrusion Guidance. Site Remediation Programs, Waste Management Division, New Hampshire Department of Environmental Services. July 2006. Revised July 2011. Available at: http://des.nh.gov/organization/divisions/waste/hwrp/sss/hwrp/guidance_documents.htm.

Table 6

Conversion of Subslab Soil Gas Concentrations to Theoretical Indoor Air Concentrations and Comparison to Air Health Comparison Values: Henry's Dry Cleaners and Goodwill Industries Store

Henry's Dry Cleaners

Sub Location	Contaminant	Soil Gas Concentration (µg/m³)	Conversion to Indoor Air Concentration^a (µg/m³)	RfC or MRL (µg/m³)	CREG (µg/m³)
SS-01	PCE	88,135.3	8,813.6	270 ^c	3.8
SS-02	PCE	32,542.3	3,254.2	270 ^c	3.8
SS-03	PCE	5,898.3	589.8	270 ^c	3.8
SS-01	TCE	408.2	40.8	2 ^d	0.24
SS-02	TCE	435.1	43.5	2 ^d	0.24
SS-03	TCE	408.2	40.8	2 ^d	0.24
SS-03	Cis-1,2-DCE ^b	2,140.1	214.0	790 ^e	None

Goodwill Industries Store

Sub Location	Contaminant	Soil Gas Concentration (µg/m³)	Conversion to Indoor Air Concentration^a (µg/m³)	RfC or MRL (µg/m³)	CREG (µg/m³)
SS-01	PCE	142,372.4	14,237.2	270 ^c	3.8
SS-01	TCE	5,908.8	590.9	2 ^d	0.24
SS-01	Cis-1,2-DCE ^b	30,515.7	3,051.6	790 ^e	None

Results in bold exceed at least one Comparison Value

RfC = EPA Reference Concentration

MRL = ATSDR Minimal Risk Level

CREG = ATSDR Cancer Risk Evaluation Guide

a Soil gas concentration multiplied by the EPA soil gas to indoor air attenuation factor of 0.1 (dimensionless) for samples collected from less than five feet below the foundation level.

b Trans-1,2-DCE value used as a surrogate

c Chronic inhalation MRL

d RfC.

e Chemical does not have a chronic inhalation MRL. The intermediate inhalation MRL was used as a surrogate.

ATSDR. 2012. Comparison Values Tables. Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry. Updated August, 2012.