

PRELIMINARY ASSESSMENT MEMORANDUM

To: John Farese, Southbridge Recycling & Disposal Park, Inc.

From: Nikki Roy, Sanborn, Head & Associates, Inc.
Matt Heil, LSP, Sanborn, Head & Associates, Inc.
Donna Vorhees, Sc.D., The Science Collaborative – North Shore

File: 3530.06

Date: November 2, 2015

Re: Residential Water Supply and Indoor Air Sampling – Risk Summary – Preliminary Results, 65 H-Foote Road, Charlton, MA

cc: Toni King, P.E., Southbridge Recycling & Disposal Park, Inc.
Tracy Markham, Southbridge Recycling & Disposal Park, Inc.
Jeff Arps, LSP, Tighe & Bond, Inc.

As discussed with you in recent telephone and e-mail correspondence, between October 28 and 30, 2015, Sanborn Head completed indoor air sampling at two H-Foote Road residences in general accordance with the “Residential Water Supply and Indoor Air Sampling, H-Foote Road, Charlton, MA” scope of work, provided to you on October 27, 2015. Air sampling was completed at the request of MassDEP in response to the detections of chlorinated volatile organic compounds (CVOCs, namely trichloroethylene [TCE], 1,1-dichloroethylene [1,1-DCE], cis-1,2-diochloroethylene [cis-DCE], 1,1-dichloroethane [DCA], and chlorobenzene) and 1,4-dioxane in samples collected from three residential drinking water wells located along H-Foote Road in Charlton, Massachusetts (65, 74 and 81 H-Foote Road).¹

As indicated in our scope of work, in addition to deploying 24-hour Summa® canisters to provide time-weighted average indoor air data, Sanborn Head also collected screening-level, real-time data using a HAPSITE® portable gas chromatograph/mass spectrometer (GC/MS) calibrated to detect TCE.² HAPSITE screening-level measurements were collected from each floor of the residences to provide supplemental information regarding the potential spatial distribution of TCE concentrations throughout the residence and to help assess potential confounding background sources of TCE from chemicals stored within the home. HAPSITE data should be considered screening-level only. The measurements collected with this instrument did not have the same level of quality assurance/quality control (QA/QC) as Summa® canisters analyzed in a laboratory and are collected over approximately one-minute intervals; therefore, they do not directly correlate with results of a sample collected over a 24-hour period with Summa® canisters. Nonetheless given the time sensitive nature of this issue, we have proceeded with this preliminary risk evaluation based on the available HAPSITE data until the results of the 24-hour samples become available as anticipated on November 4, 2015.

¹ 1,4-Dioxane was the only chemical of concern detected in drinking water from the 74 H-Foote Road residence; therefore indoor air sampling was not completed at this residence.

² The HAPSITE® was used on Day 3, rather than Day 2 as indicated in the Scope of Work due to a technical issue with the equipment on Day 2.

RESULTS – 65 H-FOOTE ROAD

At the 65 H-Foote Road residence, Sanborn Head collected a number of HAPSITE measurements throughout the residence. In general, preliminary data from these screening-level measurements indicated concentrations of TCE ranging from approximately 0.9 to 1.5 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) throughout the basement and first floor of the residence. These concentrations are well below the “Imminent Hazard Values for All Receptors” of $20 \mu\text{g}/\text{m}^3$ and the Imminent Hazard Value for fetal development effects in residential settings of $6 \mu\text{g}/\text{m}^3$, both published by MassDEP.³ Based on interviews with the site residents, we understand that there are no pregnant women or women who may become pregnant residing at 65 H-Foote Road; therefore, the Imminent Hazard Value for fetal development effects does not apply.

In addition to HAPSITE measurements collected throughout the residence, Sanborn Head collected samples during a simulated shower with minimal ventilation of the shower space. Sanborn Head ran the shower in the primary bathroom of the residence with the door closed, ventilation fan off, and the water on full-heat for 10 minutes. At the conclusion of 10 minutes, the HAPSITE screening value was approximately $30 \mu\text{g}/\text{m}^3$; at the conclusion of 20 minutes of running the shower under these conditions, the HAPSITE screening value was approximately $60 \mu\text{g}/\text{m}^3$. Once the shower was turned off and the bathroom door opened, two screening measurements (approximately 6 and $5 \mu\text{g}/\text{m}^3$, respectively) were made in the room adjacent to the bathroom, approximately 10 and 20 minutes after showering, respectively. Although the elevated showering values were screening values only, because they exceeded the “Imminent Hazard Values for All Receptors” published by MassDEP⁴ ($20 \mu\text{g}/\text{m}^3$), an Imminent Hazard notification (within 2 hours) was made to MassDEP by the Licensed Site Professional (LSP)-of-record, Tighe & Bond, Inc. on October 30, 2015.

The goal of this memorandum is to put the MassDEP’s published “Imminent Hazard Values for All Receptors” in context with site-specific exposure information from the 65 H-Foote Road residence. The exposure assumptions incorporated by MassDEP in the Imminent Hazard values do not reflect exposure at the 65 H-Foote Road residence because the occupant of the residence is exposed to the elevated screening measurements collected during showering for only part of each day; much lower ambient air concentrations were detected in the residence.

Using the HAPSITE screening measurements at the 65 H-Foote Road residence, Sanborn Head and Science Collaborative employed:

1. The MassDEP Shortform for Residential Indoor Air – Imminent Hazard Evaluation: This spreadsheet provided by MassDEP, conservatively estimates risk from a 24 hour per day (hr/d), 365 day per year (d/yr) inhalation exposure to chemicals of concern in air over an exposure period of 5 years. Using the preliminary TCE data from the HAPSITE screening measurements collected at 65 H-Foote Road on October 30, 2015, we calculated a time-weighted average exposure point concentration (EPC) for TCE, with the following assumptions:

³ August 15, 2014 MassDEP Fact Sheet: TCE Toxicity Information: Implications for Chronic and Shorter-Term Exposure.

⁴ Ibid.

- For the time spent showering each day, we conservatively assume 20 minutes exposure time at a concentration of 30 $\mu\text{g}/\text{m}^3$ and 48 minutes exposure time at a concentration of 60 $\mu\text{g}/\text{m}^3$ (for a total of 68 minutes showering time per day, as assumed in the Shortform);
- For the remainder of the day (1,372 minutes per day), we assumed exposure to an average concentration of 1.5 $\mu\text{g}/\text{m}^3$.

Conclusions: Using these assumptions, we conservatively estimate a time-weighted average EPC of 3.8 $\mu\text{g}/\text{m}^3$, **well below the Imminent Hazard Value for All Receptors published by MassDEP⁵ (20 $\mu\text{g}/\text{m}^3$)** and below the 6 $\mu\text{g}/\text{m}^3$ indoor air Imminent Hazard concentration for women of child-bearing age, although none reportedly live at or visit this residence. Using this time-weighted average EPC in the MassDEP Shortform for Residential Indoor Air – Imminent Hazard Evaluation spreadsheet, we calculated an excess lifetime cancer risk from inhalation (ELCR_{air}) **below the MassDEP benchmark of 1E-5**. In addition, we calculated a noncancer hazard quotient (HQ) of 2, which is **below the Imminent Hazard value of 10**.⁶ This Shortform is provided as Attachment A to this memorandum.

2. The MassDEP Shortform for Residential Drinking Water Evaluation– Imminent Hazard Evaluation: In addition to inhalation, dermal contact with residential drinking water also occurs while showering. To quantify the risk from this dermal exposure pathway, we used the MassDEP Residential Drinking Water Shortform with the TCE concentration of 12 $\mu\text{g}/\text{L}$ detected in drinking water for this residence. Other than entering this TCE concentration, we made no adjustments to this Shortform. We quantified risk from the dermal contact pathway and added these risks to the inhalation pathway to calculate a cumulative ELCR and noncancer HQ.

The ELCR and HQ estimates for the dermal pathway alone contributes little to those quantified for the inhalation route in item 1 above, such that exposure to TCE by way of both the inhalation and dermal routes of exposure while showering results in a cumulative ELCR that is **below the MassDEP benchmark of 1E-5** and a cumulative noncancer HQ of approximately 2 that is **below the Imminent Hazard value of 10** (and 6 for women of child-bearing age). This Shortform is provided as Attachment B to this memorandum.

(Note: This spreadsheet is provided to report risk estimates only for the dermal exposure to water while showering. In this spreadsheet, MassDEP bases its dermal exposure estimates on a young child 1 to 6 years old. If Sanborn Head had modified the spreadsheet to include adult exposure assumptions, the dermal risk would be slightly lower than the dermal risk presented for a young child included in Attachment B. The spreadsheet also includes risks associated with the ingestion and inhalation routes of exposure. The ingestion route of exposure is not currently applicable because the

⁵ Ibid.

⁶ If the assumptions are changed so that a concentration of 60 $\mu\text{g}/\text{m}^3$ total of 68 minutes showering time per day, a time-weighted average EPC of 4.3 $\mu\text{g}/\text{m}^3$ is calculated, which also results in an ELCR_{air} **below the MassDEP benchmark of 1E-5** and a noncancer HQ of 2, which is **below the Imminent Hazard value of 10**. The noncancer HQ rounds to 2 even with the addition of the dermal exposure pathway.

resident is no longer drinking or cooking with the water. The inhalation route of exposure is relevant, but the risk estimates in this spreadsheet are not relevant because they are based on modeled/calculated values, rather than the site-specific screening level measurements collected by Sanborn Head during a simulated shower.)

CONCLUSION- 65 H-FOOTE ROAD

Risk from showering: The cancer risk from both inhaling shower vapors and being dermally exposed to shower water with a concentration of TCE of 12 micrograms per liter ($\mu\text{g/L}$) falls below the MassDEP benchmark of $1\text{E-}5$, which is the same as saying there is less than a 1 in 100,000 chance of getting cancer in the Imminent Hazard scenario. The noncancer hazard for this same exposure rounds to 2, which is slightly above the MassDEP benchmark of 1 (although it is well below the benchmark for an Imminent Hazard).

Being above the MassDEP benchmark of 1 does not necessarily mean that adverse health effects are expected given the protective way that toxicity and exposure information are used to quantify these noncancer hazard indices. ***In recognition of the noncancer hazard of approximately 2, the resident at 65 H-Foote Road will be provided with a water treatment system to remove CVOCs from the residential water supply within the next two weeks. In addition, the resident has been provided a membership to a local exercise center as an alternative shower location.***

Key assumption/limitation: We've used the concentration of TCE in drinking water detected in September 2015 and air screening concentrations measured with the HAPSITE on October 30, 2015; 24-hour indoor air samples were collected in the same living areas where the HAPSITE detected concentrations between approximately 1 and $1.5 \mu\text{g/m}^3$. Therefore, because the 24-hour Summa® samples reflect a longer exposure period, they will provide a useful comparison for the HAPSITE results. **Once 24-hour indoor air sampling results are available from the analytical laboratory, the analysis completed herein will be revised with the time-weighted average concentration from the 24-hour indoor air sampling results.**

RESULTS - 81 H-FOOTE ROAD

Sanborn Head also collected a number of HAPSITE measurements throughout the residence located at 81 H-Foote Road. Preliminary data from these screening-level measurements indicated concentrations of TCE were below the instrument reporting limit throughout the three floors of this residence. Once 24-hour Summa canister indoor air sampling results are available from the analytical laboratory, these screening-level measurements will be confirmed.

Attachments:

Attachment A: The MassDEP Shortform for Residential Indoor Air - Imminent Hazard Evaluation, 65 H-Foote Road

Attachment B: The MassDEP Shortform for Residential Drinking Water Evaluation - Imminent Hazard Evaluation, 65 H-Foote Road

**ATTACHMENT A:
MASSDEP SHORTFORM FOR RESIDENTIAL INDOOR AIR –
IMMINENT HAZARD EVALUATION
65 H-FOOTE ROAD**

**Resident - Indoor Air: Table RAIH-1
 Exposure Point Concentration (EPC)
 Based on Resident Age 1-6 (Cancer and Noncancer)
 65 H-Foote Road**

ShortForm Version 10-12

Vlookup Version v0315

ELCR (all chemicals) = 1E-06
 HI (all chemicals) = 2E+00

****Do not insert or delete any rows****

Click on empty cell below and select OHM using arrow.

Oil or Hazardous Material	EPC ($\mu\text{g}/\text{m}^3$)	ELCR _{air}	HQ _{air}
TRICHLOROETHYLENE	3.8E+00	1.4E-06	1.9E+00

Women of childbearing age IH conc. > 6 ug/m3. All others' IH HQ is 10.

Time-weighted average EPC (20 min/d @ 30 ug/m3; 48 min/d @ 60 ug/m3;
 1372 min/d @ 1.5 ug/m3):
 3.8E+00

**ATTACHMENT B:
MASSDEP SHORTFORM FOR RESIDENTIAL DRINKING
WATER EVALUATION – IMMINENT HAZARD EVALUATION
65 H-FOOTE ROAD**

**Resident - Drinking Water: Table RWIH-1
Exposure Point Concentration (EPC) and Risk
Based on Resident Age 1-6
65 H- Foote Road**

ShortForm Version 03-15

Vlookup Version v0315

****Do not insert or delete any rows****

Click on empty cell below and select OHM using arrow.

ELCR (all chemicals) = 6.8E-06

HI (all chemicals) = 6.7E+00

Oil or Hazardous Material (OHM)	EPC (µg/L)	ELCR ingestion	ELCR dermal	ELCR inhalation	ELCR _{total}	Chronic			HQ _{total}
						HQ _{ing}	HQ _{derm}	HQ _{inh}	
TRICHLOROETHYLENE	1.2E+01	2.9E-06	4.1E-07	3.4E-06	6.8E-06	1.6E+00	2.3E-01	4.8E+00	6.7E+00

Note! TCE IH conc. for pregnant women is 8 ug/L. See TCE tab.