

Topics for Feb. 3, 2016 MRBCA Stakeholder Group Meeting

Vapor intrusion (VI) issues

Among the changes that will result from updating the RBTLs using EPA's Regional Screening Level methodology and inputs, the most significant will pertain to the VI pathway. These changes include how the VI-related RBTLs are developed, the RBTLs themselves and the media to which the RBTLs will apply. The changes of primary importance are as follows:

1. Instead of using the Johnson-Ettinger Model (JEM) to develop RBTLs for the VI-related pathways, the HWP proposes to use EPA's empirically-derived attenuation factors as the basis for the updated VI-related RBTLs. The attenuation factors are found in Table 6-1 of EPA's June 2015 guidance document *Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air*.
2. In updating the RBTLs, the VI-related RBTLs for carcinogenic COCs will be calculated using inhalation unit risk values instead of inhalation slope factors, consistent with EPA.
3. EPA previously classified some COCs as mutagenic, and EPA uses a different model to develop target levels for these COCs. In updating the RBTLs, the HWP proposes to use the same classifications and model. This change is not specific to VI-related RBTLs and does not pertain to all COCs, but will affect VI-related RBTLs for some volatile COCs (most notably trichloroethylene).
4. In updating the RBTLs, volatile COCs (for which VI-related RBTLs will be developed) will be identified based on EPA's definition of volatile, i.e., chemicals with a Henry's Law constant greater than or equal to 1×10^{-5} atm-m³/mole or a vapor pressure greater than or equal to 1 mm Hg (see subsection 4.13.4 of EPA's *Regional Screening Table User's Guide* [June 2015] available at <http://www2.epa.gov/risk/regional-screening-table-users-guide-june-2015>).
5. EPA has determined using soil data to assess the potential for VI is unreliable because of the difficulty in developing reliable soil target levels and limitations in accurately measuring the concentrations of volatile COCs in soil. For these reasons, the Missouri Department of Natural Resources proposes to no longer develop RBTLs for VI from subsurface soil. This will significantly affect site characterization efforts related to VI; soil data will still need to be collected, but for qualitative evaluation to determine if volatile COCs exist in soil. If they do, the potential for VI will need to be quantitatively assessed through the collection and evaluation of soil gas, sub-slab soil gas and/or indoor air samples.
6. Because MRBCA will no longer include RBTLs for VI from subsurface soil, none of the soil DTLs will be based on VI. Instead, they will be based on the lower of the RBTLs for surface soil (which are based on the combined risk from ingestion, dermal contact and outdoor inhalation of volatiles and particulates) and groundwater protection (i.e., leaching of COCs to groundwater that is used for domestic use).
7. Because RBTLs for subsurface soil VI will no longer be developed, the HWP is considering adding soil gas to the DTLs, though only for volatile COCs. This addition could facilitate screening for VI at the DTL stage despite the lack of RBTLs for VI from subsurface soil, though that would likely require data from near source soil gas samples be compared to the soil gas DTLs. Using soil gas at the DTL stage

is potentially problematic due to the reliability of soil gas samples, the degree to which we can be confident initial investigations have truly identified maximum concentrations of volatile COCs at a site, preferential vapor migration via man-made and natural conduits (e.g., utilities, fractures in tight clay soils, etc.) and the presence or absence of buildings on the site during initial investigations.

8. Because the JEM will no longer be used to develop VI-related RBTLs, with the updated process Tier 2 SSTLs for VI will be calculated using a department-approved model to calculate a site-specific attenuation factor, with the attenuation factor then being plugged into a model developed by DHSS that will then calculate VI-related SSTLs. Discussion is needed to identify models appropriate for development of site-specific attenuation factors.
9. Surface soil and VI: Section C.2.1 and Table C-1 of the 2006 MRBCA guidance indicate surface soil need not be included in an evaluation of vapor intrusion (note, however, the exposure pathways for which surface soil must be evaluated include outdoor inhalation of vapors and particulates from surface soil). Reportedly, excluding surface soil from VI evaluations was based on the assumption that any existing building would extend at least three feet beneath the surface of the ground (surface soil is defined as the soil from the surface to a depth of three feet) and the construction of any future building would entail the removal of surface soil prior to construction. The HWP does not believe these assumptions are applicable in every case, and therefore we are proposing to revise the guidance to require when surface soil is contaminated with volatile COCs, surface soil be included in the evaluation of VI. However, RBTLs will not be developed for the surface soil VI pathway; instead, the guidance will need to explain that surface soil must be screened for the presence of volatile COCs and, if such COCs are found, additional evaluation using soil gas, sub-slab soil gas and/or indoor air data will be necessary.
10. EPA published two VI guidance documents in 2015:
 - OSWER Technical Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air [OSWER 9200.2-154]
 - Technical Guidance for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites [EPA 510-R-15-001]

Both guidance documents are available at <http://www.epa.gov/vaporintrusion>.

The 2006 MRBCA guidance provides only limited instruction regarding evaluating VI pathways, and since 2006, VI evaluation methods and target level development have evolved significantly. The department believes the MRBCA guidance should be revised to address VI evaluations in greater detail. However, an alternative would be to adopt EPA's guidance documents in their entirety. Doing so would be a significant change, in particular with respect to the evaluation of petroleum VI, but it would make MRBCA more consistent with EPA. The BVCP regularly oversees sites with petroleum contamination, but only when the contamination is not associated with a regulated UST or AST.

Given the above discussion, the question is whether MRBCA should incorporate by reference the two EPA VI guidance documents, or should the department work with the stakeholder group to develop more detailed, Missouri-specific guidance for inclusion in the MRBCA document?

Definition of “free product”

The MRBCA guidance does not include a definition of free product (FP). EPA defines “non-aqueous phase liquid” as follows: “A non-aqueous phase liquid (NAPL) is a chemical compound that is liquid in its pure form, does not readily mix with water, but does slowly dissolve in water. A dense NAPL (DNAPL) sinks in water, while a light NAPL (LNAPL) floats on water. When released to the environment, DNAPLs and LNAPLs are sources of groundwater contamination.” The Tanks RBCA guidance slightly alters this definition with the statement in subsection 6.8 that FP is the “mobile phase of LNAPL.”

In addition, the Tanks RBCA guidance sets forth specific requirements applicable to FP in subsections 6.8 to 6.8.5, including:

- Protecting against explosive risks when FP is present
- Delineation of FP
- Considerations for risk assessment when FP is present
- FP plume stability determinations
- Practicability of FP removal

Should the MRBCA guidance be revised to include EPA’s definition of NAPL, with or without the alteration in subsection 6.8 of the Tanks RBCA guidance?

Should specific provisions for FP, such as those found in the Tanks RBCA guidance, be included in the MRBCA guidance?

FP Recovery

The MRBCA guidance and rule do not include guidance or requirements for FP removal. Rules applicable to petroleum underground storage tanks (USTs) require the removal of FP “to the extent practicable.” Should this same standard be applicable under the MRBCA process? Because the “extent practicable” requirement is not risk-based, the HWP does not believe the requirement should be automatically applicable under MRBCA, though it might be an appropriate remedial goal in some cases.

Note a site to which the requirement to recover FP to the extent practicable applies would necessarily be addressed under the Tanks RBCA guidance, and not under MRBCA.

Discussion of this issue by the MRBCA Stakeholder Group should include consideration of both LNAPL and DNAPL and the differences between the two, including recoverability.

Should RBTLs be capped at soil saturation and solubility?

Because, at least in theory, the presence of contaminants at concentrations greater than soil saturation limits or solubility limits will result in free product being present in soil or groundwater, when a RBTL exceeds a soil saturation or solubility limit, should the RBTL be capped at the soil saturation or solubility limit?

Capping RBTLs at soil saturation concentrations would pertain only to COCs that are liquid. Should the guidance require soil saturation limits and/or solubility limits be met in every case, recognizing that, if so, this would result in a de facto requirement for FP removal? Or should removal be solely dependent on risk?

Note, although the 2006 MRBCA guidance includes saturated soil concentrations in Table B-12, the guidance does not actually refer to this table or otherwise speak to the subject of soil saturation concentrations.

Also, should the following soil saturation definition be included in the guidance: “A concentration that is chemical-specific and corresponds to the chemical concentration in soil at which the absorptive limits of the soil particles, the solubility limits of the soil pore water, and saturation of soil pore air space have been reached. Above this concentration, the chemical may be present in free phase, i.e., as a non-aqueous phase liquid for chemicals that are liquid at ambient soil temperatures and pure solid phases for chemicals that are solid at ambient soil temperatures.”

Representative concentration (RC) when FP is or has been present

The last bullet of subsection C.3 of Appendix C (page C-11) states that the effective solubility of the various chemicals in FP should be used in developing a representative concentration when a well contains or has contained FP. Note this provision first appeared in subsection E.3 of the Tanks RBCA guidance (which was published in 2004, two years before MRBCA), and was included there primarily in recognition of the difficulty associated with analyzing FP.

In addition, subsection E.11 in Appendix E of the 2006 MRBCA guidance states that, because the primary exposure pathways associated with LNAPL and DNAPL are vapor intrusion and protection of groundwater used for domestic use, the “key step is the calculation of the vapor concentration and the dissolved concentration” of COCs “emanating from the LNAPL/DNAPL.” The subsection goes on to provide some instruction in calculating vapor and dissolved COC concentrations when LNAPL/DNAPL is present.

Should the MRBCA guidance continue to allow the use of effective solubility, calculated soil vapor, and calculated dissolved concentrations to represent COC concentrations when LNAPL/DNAPL is present? Or should the guidance be revised to require COC concentrations in and associated with LNAPL/DNAPL be determined through LNAPL/DNAPL sampling and analysis and vapor sampling and analysis?

Site Characterization Issues

Delineation requirements: Section (4)(B) of the MRBCA rule requires initial COC delineation determine whether and to what geographical extent maximum COC concentrations exceed the DTLs, and the DTLs “or other residential levels necessary to protection the receptors from complete exposure pathways” must be used as delineation criteria during the initial delineation efforts. (Note the rule stipulates that comparison of maximum COC concentrations to the DTLs is not required if the site will be evaluated at Tier 1 or Tier 2).

However, for a Tier 1 or Tier 2 assessment, section (9)(C) of the rule requires delineation must be conducted to: a) determine all potential human and ecological receptor pathways, b) identify the extent of contamination above the RBTLs or SSTLs for each exposure pathway and c) to identify exposure domains for each receptor-pathway-route of exposure. Therefore, under the current MRBCA rule and guidance, at Tiers 1 and 2, delineation criteria are dependent on the exposure model.

Given that the MRBCA rule and guidance also require an environmental covenant be used at every site at which COCs will remain at concentrations above residential standards, should the guidance and rule instead require delineations at Tiers 1 and 2 be residential RBTLs in every case?