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## **SOIL GAS SAMPLING GUIDANCE**

This posting is intended to clarify the department's guidance concerning soil gas sampling at LUST sites:

### **For the groundwater vapor to enclosed space pathway:**

Groundwater vapor sampling must be conducted within 5 feet of the groundwater source location or at an alternate point of compliance. Sampling at the groundwater source location can be used to address all actual and potential vapor receptors. Sampling at an alternate point of compliance may only be used to clear a specific receptor. If there is more than one vapor receptor, several alternate points of compliance may be required.

The groundwater vapor sample must be collected at a depth above the water table where the highest vapor readings are expected. For this pathway, this is regarded as within 1 foot above the static water level. However, the depth need not exceed the typical depth of the receptor being evaluated (e.g., samples may be collected from a depth of approximately 8 to 10 feet to clear a potential basement receptor, or from a depth of 20 feet if an actual sanitary sewer was installed 20 feet below the ground.)

Groundwater vapor sampling may be used, but is not required, to monitor the site if groundwater concentrations exceed applicable site-specific target levels (SSTLs). However, if groundwater concentrations do not exceed SSTLs, but groundwater vapor samples have exceeded the action levels, then groundwater vapor monitoring is required (i.e., In by groundwater vapor, out by groundwater vapor.). For long term groundwater vapor monitoring, a new groundwater vapor well must be installed after the previous groundwater vapor well has been sampled twice. The new groundwater vapor well must be installed within 5 feet of the groundwater source(s). Two consecutive 'passing' samples are needed to clear this pathway. The second passing sample may be a confirmation sample taken at least two weeks following the "passing sample" event.

### **For the soil vapor to enclosed space pathway and soil leaching to groundwater vapor to enclosed space pathway:**

Soil gas sampling must be conducted within 5 feet of the soil source location or at an alternate point of compliance. Sampling at the soil source location can be used to address all actual and potential vapor receptors. Sampling at an alternate point of compliance may only be used to clear a specific receptor. If there is more than one vapor receptor, several alternate points of compliance may be required. For the soil leaching pathway, an alternate point of compliance can be used only if steady state conditions have been documented.

The soil gas sample must be collected at a **depth above the water table** where the highest vapor readings are expected. For these pathways, this is regarded as **the depth of the soil source sample**. Or, for the alternate points of compliance, the depth of the receptor being evaluated should be used. In either case, the depth of the soil gas sample need not exceed the typical depth

of the receptor being evaluated (e.g., samples may be collected from a depth of approximately 8 to 10 feet to clear a potential basement receptor, or from a depth of 20 feet if an actual sanitary sewer was installed 20 feet below the ground).

Soil gas cannot be used to clear these pathways if the soil source sample is submerged. You must evaluate these pathways following standard Tier 2 procedures. An option is to demonstrate the entire plume to the lowest applicable target level (e.g., The 1.16 PPM benzene plume for the confined space residential space pathway plume if confined space receptors are present and zoning is residential) is submerged and groundwater is not likely to fluctuate enough to expose the soil source and/or plume.

### Questions & Answers.

We recently received a letter from a consulting firm requesting clarification of a number of soil gas testing issues. The issues raised are applicable to a number of common occurring site conditions. Our response to the questions is in bold.:

- Refer to the top paragraph on Page 35 under the Soil Vapor to Enclosed Space pathway. This paragraph states, “in the event soil gas concentrations exceed the soil gas target levels, but soil concentrations are below the applicable target levels, definition of the soil gas plume...may be warranted.” Then the top paragraph on Page 37 under the same Soil Vapor to Enclosed Space pathway states, “if soil gas target levels are exceeded, either the pathway shall be classified high risk, or indoor vapor measurements may be taken.” These two paragraphs appear to conflict. Does the second paragraph on Page 37 refer to situations in which soil vapor fails but soil concentrations are above the applicable target level? The paragraph on Page 35 explicitly defines the soil concentration condition; however, the paragraph on Page 37 does not explicitly discuss soil concentrations. **We do not consider the paragraphs to conflict. The paragraphs discuss two different issues. The first referenced paragraph discusses soil gas plume definition. The second paragraph discusses the option of conducting indoor air sampling to clear actual receptors if soil and soil gas target levels are exceeded. Please be aware, if an actual receptor is inside the soil gas plume (where soil target levels are not exceeded at the site) we would allow using indoor vapor sampling to clear receptors.**
- To build on question #1 above, what is the procedure for defining the soil vapor plume? **Install soil vapor wells and conduct vapor sampling.**
- How close do the vapor wells need to be to one another? **This is a decision for the certified groundwater professional to make. Generally it would appear, at a minimum, vapor wells would need to be installed in four directions around the failing well(s).**
- For the purposes of classifying receptors, do we simply draw a line connecting the vapor wells which are below target levels and use that line as a proxy for the Receptor I.D. map? **Yes. See page 49 of the guidance. To be consistent we would apply the same procedure for defining plumes as is used in a bedrock situation.**

- In that event, any actual receptor entering this vapor well perimeter would be classified as high risk, and any potential receptor classified as low risk?

**Yes.**

- The Tank Memo of March, 1999 states “if documentation is provided showing the soil contamination plume is continually submerged, this pathway [Soil Vapor to Enclosed Space] is considered incomplete.”

a) Does this mean showing that the soil source (a point location) is submerged or that the entire soil plume (as implied by the quoted statement) is submerged?

**The statement refers to the soil plume. It would be the soil plume exceeding target levels. We realize in many instances this data would not be available.**

b) Given the large seasonal and yearly groundwater fluctuations, what is to be done if the soil source is submerged some periods and not others?

**An option available is to take the vapor sample when the soil source is not submerged.**

c) There are many sites where a vapor well has been installed and sampled with a soil source that is not continually above static water levels. If a vapor well exceeds Tier 1 levels at one of these sites, where the Tank Memo states the soil Vapor to Enclosed Space pathway is no risk if submerged, how do we address the pathway?

**The pathway is not cleared if the soil vapor sample failed and the soil source is not continually submerged.**

Does the Soil Vapor pathway still not apply?

**No it applies.**

and the Soil Leaching to Groundwater Vapor pathway become high risk?

**The classification depends on the receptors.**

This vapor well, six inches above static water, should still be valid for the Soil Leaching to Groundwater Vapor pathway.

**Yes under the following conditions: Soil vapor sampling is done at the soil source and the soil source is not submerged.**

- The Soil Gas Sampling section on Page 12 states, “soil gas must be sampled at a depth above the water table where the highest PID reading is expected...however, the depth at which the soil gas sample is taken need not exceed the typical depth of the receptor being evaluated.” It has occurred in past reviews from the DNR that soil maximums were recorded at 19 feet, the deepest known conduit was recorded at 10 feet, and static water was below both. Vapor samples were taken from 19 feet, at the soil maximum, both of which passed. The DNR still required vapor wells at the conduit depth of 10 feet. Though the Guidance Document states that we can take vapor samples at the deepest conduit depth, this should not rule out samples at the soil maximum. If vapors are emanating from the soil maximum, they should decrease with distance from the source. Therefore, if vapor samples are below target levels at the soil source, then they should be even lower at the conduit some distance away. Are we required to take vapors at the deepest conduit if the soil maximum is below that depth?

**No.**

In a similar situation, is there a maximum depth between the vapor well and static water level above which vapor samples cannot be taken for the Groundwater Vapor pathway?  
**The vapor sampling point must be located within 1' above the static water level when conducting vapor sampling at the static water level vadose zone interface.**

Please be aware, as an option, vapor sampling may be conducted at the depth of the receptor. Page 31 of the Tier 2 Guidance under 3.3.7 indicates that "Generally, soil gas must be sampled at a depth just above the water table; however, the sampling depth need not exceed the typical depth of the receptor being evaluated." For example, if the static groundwater level is at 50 feet, the certified groundwater professional may conduct the vapor sampling at a depth of 8 to 10 feet to clear basement receptors.

- For example, static groundwater is recorded at 10 feet when the vapor well is installed. Groundwater later moves to 13 feet for the confirmation vapor sample, is the sample no longer valid?

**In this example, we would consider a confirmation sample, also taken at 10', to be valid. We will consider confirmation samples taken from the initial sample point to be valid if the drop in water level does not exceed 3 feet.**

If so, does the DNR require that multiple vapor wells at different depths be installed to address the Groundwater Vapor?

**See the previous response. An additional vapor well at a different depth may be required for confirmation sampling if the water level has dropped more than 3'.**

- The guidance does define studying groundwater levels for seasonal highs and lows and that "one of the samples must be taken during a seasonal period of lowest groundwater elevation." This would therefore necessitate the installation of multiple vapor wells at different depths. This would also preclude the timely sampling (before project, funding, and DNR deadlines) of vapor wells if seasonal patterns required definition first. We have not experienced any requirements from the DNR regarding seasonal fluctuations and vapor well installation. Is this policy still valid in its entirety, or has it been modified?  
**The guidance reflects what is in administrative rule. This is a rule provision developed by the RBCA Technical Advisory Committee. It has been very difficult for us to administer for the reasons you have stated. Our expectation is that certified groundwater professionals make an effort to evaluate groundwater levels over time and conduct the sampling as the administrative rules and guidance require. This technical requirement is not a "report rejection" item. We are not aware of any projects being rejected because the technical requirements in guidance and administrative rule concerning this item were not followed.**

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