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Environmental Protection Agency
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1200 Pennsylvania Avenue, NW
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Attention Docket ID No. RCRA-2002-0033

Dear Sir or Madam:

Re: *Guidance for Evaluating Vapor Intrusion to the Indoor Air Pathway From Groundwater and Soils*, November 29, 2002, Draft

On November 29, 2002, the U.S. Environmental Protection Agency (EPA) released for public comment a draft guidance document, *Guidance for Evaluating Vapor Intrusion to the Indoor Air Pathway From Groundwater and Soils* (67 *FR* 71169, November 29, 2002). The U.S. Department of Energy (DOE) appreciates the opportunity to comment on this draft guidance. The enclosed DOE comments are divided into two sections: general and specific.

The DOE's general comments address broad issues regarding the guidance. The specific comments address particular sections of the guidance document. For clarity, each specific comment is preceded by a reference to the section of the document to which it applies and a quote of the text to which DOE's comment is directed.

If you have any questions or need further clarification of our comments, please contact Jerry Coalgate of my staff at 202-586-6075 or *jerry.coalgate@eh.doe.gov*.

Sincerely,

Andy Lawrence

Andy Lawrence
Director
Office of Environmental Policy and Guidance

Enclosure

UNITED STATES
DEPARTMENT OF ENERGY

Comments On *Draft Guidance for Evaluating the Vapor Intrusion To Indoor Air Pathway From Groundwater and Soils* (67 *FR* 71169, November 29, 2002)

U.S. Environmental Protection Agency
Docket ID No. RCRA-2002-0033

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U.S. Department of Energy
Comments On
Draft Guidance for Evaluating the Vapor Intrusion To Indoor Air Pathway From Groundwater and Soils
67 *FR* 71169, November 29, 2002
U.S. Environmental Protection Agency (EPA)
Docket ID No. RCRA-2002-0033

GENERAL COMMENTS

1. The EPA is to be commended for its efforts to develop a draft guidance document addressing the subsurface Volatile Organic Compound (VOC) to indoor air exposure pathway. The guidance employs a tiered approach intended to allow the user to conduct progressively more detailed and realistic evaluations of potential exposure in order to determine if there is a complete exposure pathway, and if there are potentially significant exposures and risks through that pathway.

   However, while the guidance may present a technically comprehensive approach to evaluating vapor intrusion to the indoor air pathway, DOE is concerned the document may not be as useful or effective as desired. Specifically, the guidance addresses only one component of the "Current Human Exposures Under Control" environmental indicator determination, and appears unnecessarily lengthy (approximately 180 pages). The previous indoor pathway guidance (December 2001) is approximately 30 pages in length.

   The DOE suggests EPA consider providing shorter and more general guidance that allows for greater flexibility in the approach to evaluating indoor air pathways. For example, EPA could provide a general "web-based" guidance document that discusses the technical details as hyperlinks. A similar approach was used for the *Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action (EPA 530-F-01-021, 2002)* provided on EPA's corrective action website [http://www.epa.gov/correctiveaction/resource/guidance/gw/gwhandbk/gwhndbk.htm] with relevant links to various regulatory and guidance documents elsewhere on the EPA website(s).

2. The DOE recognizes that vapor intrusion pathway assessment is a rapidly evolving field, and that there is uncertainty regarding the significance of the pathway on a site-specific basis. It seems this uncertainty may have prompted EPA to specify extremely stringent data needs for evaluating the indoor air pathway, and to provide a process that may be overly prescriptive given that it is likely to keep changing. For example, the flow charts for the pathway assessment contain many steps requiring the user to collect more data, and specifying the types of data collection. In general, this process could be more flexible, and users of the guidance could be granted more latitude regarding data collection as long as the user develops an articulated decision-making framework and

well defined data quality objectives. The EPA should be clearer that the flow charts and other elements in the guidance be viewed as a point of departure, rather than the definitive process.

3. For the areas in this guidance document that address groundwater as a potential source of vapor intrusion to indoor air, DOE suggests that EPA be more emphatic in highlighting the need for flexibility and the importance of site-specific knowledge in performing the various screening steps. The DOE complex includes a large variety of sites with a range of geologic and hydrogeologic conditions that have been found to influence migration of contaminants into, out of, and through the vadose zone and groundwater in often unpredicted ways. Consequently, DOE expects that understanding vadose zone properties and groundwater pathways will need to be emphasized as key to applying this guidance to groundwater as a source for vapor intrusion to the indoor air pathway. Two examples serve to highlight this need:

   For instances where this guidance would be applied to shallow groundwater contamination, information on the distribution (horizontal and vertical) of contaminants in the groundwater may be more critical than situations where the groundwater contamination is much deeper, or is relatively isolated by intervening or less permeable geological strata. Thus, the need to collect data or perform subsurface investigations for contaminant delineation and level screening would be highly dependent on an understanding of the subsurface conditions and hydrogeology of the particular site.

SPECIFIC COMMENTS – MAIN GUIDANCE DOCUMENT

I. INTRODUCTION. B. What is the Intent of this Guidance?

1. **Page 1, paragraph 1, lines 5-6: "A complete pathway means that humans are exposed to vapors originating from site contamination."**

   A complete pathway does not necessarily mean that humans "are" exposed to vapor contaminants above health-based concentrations in all cases; only that humans are "exposed" to vapors. Furthermore, in some cases, this guidance will be used to assess situations where there is no current exposure, yet future exposures due to contaminant levels in excess of health-based levels, are reasonably foreseeable (although we cannot predict with certainty, and the future exposures may never materialize). Therefore, the Department suggests the EPA clearly define what "exposure" means. For example, a definition could be expressed in terms of levels of contaminants in vapors above applicable health-based levels.

I. INTRODUCTION. D. What is the Scope of the Guidance?

2. **Page 2, letter D, paragraph 1, lines 2-6: "The approaches suggested in this draft guidance are primarily designed to ensure protection of the public in residential settings but may be adjusted for other land uses (e.g., commercial/industrial,**

recreational), so that human exposures in non-residential settings may also be considered under this guidance as described below."

The DOE agrees that it is feasible to adapt this guidance to non-residential settings; however, with regard to investigative approaches or default modeling assumptions, the guidance does not contain any content that addresses non-residential settings. In particular, the empirical attenuation factors are based entirely on a residential database, and their applicability to non-residential structures is questionable. In that respect, DOE is aware that the State of Michigan has made an effort to develop default modeling assumptions for commercial/industrial structures. This, along with other information such as may be pertinent to non-residential evaluations, should be referenced and/or incorporated into the guidance as appropriate.

3. **Page 2, letter D, paragraph 1, lines 4-5: "EPA personnel (and of course, states) are free to use and accept other technically sound approaches..."**

The DOE suggests providing links and/or references to examples of "other technically sound approaches."

I. INTRODUCTION. D. What is the Scope of the Guidance? 1. Occupational settings where persons are in a working situation.

4. **Page 3, paragraph 1, lines 6-10 and paragraph 2, lines 1-2. "OSHA and EPA have agreed that OSHA generally will take the lead role in addressing occupational exposures. Workers will generally understand the workplace (e.g., Occupational Safety and Health Administration, OSHA) regulations (and monitoring, as needed) that already apply and provide for their protection ... In general, therefore, EPA does not expect this guidance to be used for settings that are primarily occupational".**

The guidance should be more definitive in excluding the need to assess vapor intrusions in buildings where the occupants are covered by provisions of OSHA. Specifically, compliance with OSHA standards in these buildings should be considered an incomplete pathway for all environmental contaminants.

I. INTRODUCTION. D. What is the Scope of the Guidance? 2. Non-residential settings where persons are in a non-working situation

5. **Footnote page 3: " It should be noted that at CERCLA sites, the cleanup levels are generally determined either by ARARs or risk range considerations; the OSHA standards are not ARARs under the CERCLA statute and regulations. Therefore, there may be instances (under CERCLA and other cleanup programs) where standards other than the OSHA standards are used to determine whether the exposure pathway presents a risk to human health."**

As stated, this footnote gives the impression that OSHA standards are not appropriate for evaluating indoor air exposures in occupational work settings. Although DOE recognizes that OSHA standards are not always ARARs under CERCLA, OSHA standards can be reasonable bases for evaluating human exposures in occupational settings. The DOE suggests that EPA clarify those instances in occupational settings "where standards other than the OSHA standards are used to determine whether the exposure pathway presents a risk to human health."

IV. USE OF THIS GUIDANCE. A. Under What Conditions Do We Recommend You Consider This Pathway/Guidance?

6. **Page 8, letter A, paragraph 1, lines 1-8. "We recommend that you consider the possibility of exposure by this pathway if you have or suspect the presence, in soil or groundwater, of volatile chemicals (Henry's Law Constant > $10^{(-5)}$ atm m^3/mol) at your site as follows:**
   - **located 100 ft or less in depth or**
   - **located in close proximity to existing buildings or future buildings (see Primary Screening Question # 2 for the definition of closure proximity), or**
   - **To the expected footprint of potential future buildings (for non-E.I. determinations)."**

   The meaning and/or intent of the third bullet is unclear. We suggest it be revised and the meaning clarified to address those where the volatile chemicals have to be located relative to the "expected footprint" in order for this recommendation to apply.

IV. USE OF THIS GUIDANCE. C. How Is The Guidance To Be Used In Making Current Human Exposures Under Control Environmental Indicator (EI) Determinations?

7. **Page 9, letter C, paragraph 1, lines 3-4: "However we do not believe that confirmatory sampling will generally be necessary in that context."**

   This guidance implies there are situations where confirmatory sampling would be necessary in making "human exposure controlled" determinations. Accordingly, the DOE suggests EPA describe those situations (e.g., by examples) where confirmatory sampling would likely be required.

8. **Page 9, letter C, paragraph 1, lines 8-11: " Additionally, the recommended approaches are designed to help site decision makers differentiate those sites for which there is more likely to be unacceptable vapor intrusion from those where unacceptable vapor intrusion exposures are less likely."**

   The DOE suggests rewording the lines to read: "Additionally, the Tiered Approach, recommended in this guidance document, is designed to help site decision makers differentiate those sites for which there is more likely to be unacceptable vapor intrusion from those where unacceptable vapor intrusion exposures are less likely."

9. **Page 9, letter C, paragraph 2, lines 3-5: "For purposes of making Current Human Exposures Under Control EI determinations with respect to vapor intrusion under RCRA and CERCLA, EPA generally recommends the use of 10^{-5} values." This level, in EPA's view, serves as a reasonable screening mechanism for the vapor intrusion pathway. Additionally, it takes into account practical issues associated with the analytical difficulties in taking air measurements and the possible presence of many constituents of concern due to contributions of "background" sources, including ambient (outdoor) air and/or emitted from indoor sources.**

The rationale for this approach is that it accounts for analytical difficulties in air monitoring, and background sources of VOCs in air. Furthermore, because the attenuation factors proposed in the guidance are sufficiently conservative (such that a 10^{-4} risk level is unlikely to represent a significant risk under current conditions), setting the target risk level at 10^{-5} to account for cumulative risks from indoor or outdoor air sources may not be an appropriate. Since EI determinations are an element of CERCLA/RCRA risk evaluation and management decision-making, it seems reasonable that the CERCLA/RCRA risk management levels (10^{-4} to 10^{-6}), which are intended to address incremental risks associated with sites, can be used for pathway completion determinations instead of the proposed 10^{-5} level without incorporating considerations of background (background indoor or outdoor air quality should be factors in characterizing potential exposure pathways, rather than assessing cumulative risks). Consequently, target risk level for determining that the vapor intrusion pathway is under control should be more flexible corresponding to the risk range used in CERCLA and RCRA decision making to better account for site-specific and analytical conditions.

Finally, EPA should consider developing a screening mechanism specifically for determining cumulative risks from indoor/outdoor air sources based on EPA's proposed cumulative risk assessment framework document (Framework for Cumulative Risk Assessment, External Review Draft, EPA/630/P-02/001A, April 23, 2002).

IV. USE OF THIS GUIDANCE. H. How Should "Background" Be Considered In Evaluating The Contribution Of Subsurface Contamination To Indoor Air Contamination?

10. **Page 11-12, letter H, paragraph 1, lines 1-3, 19-22, and paragraph 2, lines 1-9: "We believe that it is critical to consider the presence of background concentrations in assessing the vapor intrusion pathway. Background concentrations may be impacted by volatile chemicals commonly found in the home or found in local atmospheric emissions... "We recommend the relative contributions of background sources be carefully considered (see Appendix I) in order to properly assess the potential inhalation exposure risks that can be attributed to the vapor intrusion pathway."**

"It may be a challenge to distinguish "background" (ambient outdoor and indoor air) sources of vapors from site-related contamination. However, we recommend vapors attributable to background sources be accounted for during "Site Specific Assessment" to properly assess the potential risk posed by exposures via the vapor intrusion pathway. To the extent practicable, we recommend that background sources of contamination be removed or excluded from the site dwellings or occupied buildings selected for sampling before any indoor air sampling is conducted. If this is not possible, then we recommend the contribution from these sources be carefully considered when evaluating any indoor air sampling results (See Site-Specific Question # 6)."

The DOE believes that evaluating the contribution to indoor air contamination from "background" sources could, in some circumstances, be a difficult and costly endeavor. How background is taken into account in determining whether the pathway is complete may be pivotal to "Indoor Air Vapor Intrusion Pathway Complete"/"Human Exposures Controlled" environmental indicator (EI) determinations. Therefore, the EPA should provide guidance on how to distinguish between contamination sources and "background" and naturally occurring sources and "background." The guidance only says that background should be "carefully considered."

Note: CERCLA Section 104(a)(3) prohibits (except in limited circumstances) response actions for releases or threatened releases of "background" contaminants (i.e., "naturally occurring substances in . . . unaltered form . . . from a location where [they are] naturally found)." 42 USC Section 9604(a)(3).

IV. USE OF THIS GUIDANCE. FIGURE 2. "Schematic Flow Diagram: Evaluation Process Recommended in Guidance"

11. Page 13: "Figure 2."

The Schematic Flow Diagram, Figure 2 only makes reference to Questions 4-6. No mention is made of Questions 1-3. Also, the first section "Compile Site Information" is not a discrete part of the guidance document and does not precede the "Tier 1" section, as suggested in the diagram. The DOE suggests this figure be revised to include citations or footnotes that cross-reference to the corresponding flowcharts or figures in Appendix C. This would help the reader better ascertain how the questions "fit together" in the overall approach presented in the Figure 2 schematic.

IV. TIER 1 – PRIMARY SCREENING. B. Primary Screening – Question 2, "Are currently (or potentially) inhabited buildings or areas of concern under future development scenarios located near (see discussion below) subsurface contaminants found in Table 1."

12. **Page 18, Number 4: <u>"Identify Inhabited Buildings (or Areas with Potential for Future Residential Development) Within Distances of Possible Concern:"</u>**

Because the guidance can be used with respect to future development where humans may be impacted in other than residential scenarios (e.g., commercial, recreational), DOE suggests replacing" Areas with Future Residential Development" with a more generic "areas of concern under future development scenarios." This would be more consistent with the phrasing used in Question 2.

IV. TIER 1 – PRIMARY SCREENING. C. Primary Screening – Question 3 "Does evidence suggest immediate action may be warranted to mitigate current risks?"

13. **Page 19, Q3: <u>"If YES-check here and proceed with appropriate actions to verify or eliminate imminent risks..."</u>**
<u>"If No–check here and continue with Question 4."</u>

Unlike previous questions, no reference is made to the "rationale and references" section. Revise to insert, "Describe the rationale below" after "check here."

V. TIER 2 – SECONDARY SCREENING

14. **Page 21, paragraph 1, lines 1-3: <u>"The vapor intrusion pathway is complex and, consequently, we recommend that a comprehensive assessment of this pathway using all available lines of evidence be conducted before drawing conclusions about the risks posed by this pathway."</u>**

This statement is at odds with the tiered approach used in this guidance for determining whether the vapor pathway is complete and poses unacceptable risk. The tiered approach is designed to allow a determination in certain circumstances without having to use "all available lines of evidence." The DOE suggests deleting this sentence.

15. **Page 21-22, paragraph 3, lines 16-18: <u>"However, we recommend that groundwater data still be evaluated, particularly if the plume extends beyond the unsaturated zone source of vapors, but only in conjunction with soil gas data."</u>**

The DOE recommends that EPA clarify the meaning of "extends beyond the unsaturated zone source of vapors." Also, EPA should clarify "how" the groundwater data should be evaluated "in conjunction" with the soil gas data. The DOE also asks that EPA clarify those situations where both groundwater data and soil gas data are needed to evaluate the vapor intrusion pathway.

V. TIER 2 – SECONDARY SCREENING. A. Secondary Screening – Question 4: Generic Screening

16. **Page 23, Q4(b): "Do measured indoor air concentrations of constituents of potential concern identified in Question 1 (and any degradation products) exceed the target concentrations given in Tables 2(a), 2(b), or 2(c)?"**

The DOE suggests that a decision rule (a statement presented in an "if-then" form) be formulated for evaluating measured indoor air concentration data against the target concentrations. An example of a decision rule would be: "if indoor air concentrations in any single sample fall below target concentrations in two consecutive sampling events, then further sampling can be terminated." While the level of detail in Question 4(b) is appropriate for a decision framework, it does not adequately describe for users how indoor air data should be evaluated.

17. **Page 23, Q4(c): "Is there any potential contamination (source of vapors) in the unsaturated zone soil at any depth above the water table?"**

This question (and its following explanatory material) seems to suggest that vapor releases in indoor settings (e.g., dry cleaner) can potentially migrate via advective diffusion through flow openings and contaminate the vadose zone. The rationale for arguing this as a source is that the vapor density may be sufficient to represent a downward driving force. However, airborne contaminants essentially have the vapor density of ambient air, unless they are present at levels of several percent. Also, slight depressurization of buildings relative to soil gas, which is a mechanism of vapor intrusion to indoor spaces, would tend to work against vapor migration from a building or similar structure into soil gas. It is suggested that EPA clarify the circumstances when such advective migration is a reasonable assertion, or delete this consideration from the guidance.

18. **Page 26: "Q4(i): Are there site conditions and/or data limitations that may make the use of generic soil gas attenuation factors inappropriate?...Factors that, in our judgment, typically make the use of generic soil gas attenuation factors inappropriate include:"**

The guidance states that the generic attenuation factors for use with soil gas data should not be applied to shallow soil gas contamination and buildings with sumps. The guidance also states that the attenuation factors should not be applied to buildings with very low air exchange rages or high indoor/outdoor pressure differences. It is not clear why buildings with sumps coupled with VOCs in shallow soil gas (less than 15 feet below foundation level) uniformly represent an inappropriate setting for the generic attenuation factors. The Johnson and Ettinger model shows that the floor opening to total floor space ratio is a relatively insensitive parameter in the model. Unless VOC-impacted groundwater is present in the sump, the presence of a sump should not invalidate the default attenuation factors. The DOE suggests that EPA describe the data supporting this assertion in the

guidance. Otherwise, it may be advisable to delete reference to this assertion from the guidance. In addition, the guidelines for buildings with very low air exchange rates or higher indoor/outdoor pressure differentials would be very difficult to implement in practice, because they are based on data that are difficult to obtain. It is suggested that EPA specify more practical criteria for identifying such buildings.

VI. TIER 3- SITE-SPECIFIC ASSESSMENT

19. **Page 38, paragraph 4, lines 7-9: "Alternately, it may be appropriate to reduce potential exposures with a mechanical ventilation system in the event buildings are constructed over subsurface vapor sources."**

This alternative appears to suggest a remedy for potential vapor sources, rather than an alternative for measuring such vapors. Because EPA stated "this guidance is not intended to provide recommendations on how to eliminate risk", the Department suggests deleting references to recommendations for risk-reducing actions. The EPA may wish to consider developing an additional guidance document addressing potential approaches to remediation of vapor intrusion problems at some point in the future.

VI. TIER 3- SITE-SPECIFIC ASSESSMENT. A. Site Specific Assessment – Question 6

20. **Page 42, Number 1, What is the goal of this question?, lines 6-9: "However, EPA recommends that predictive modeling can be used to support Current Human Exposures Under Control EI determinations without confirmatory sampling these determination."**

The DOE recommends deleting "these determination" from the end of this sentence for purposes of clarity.

21. **Page 42, Number 2, How should you complete this evaluation?, lines 4-14: "Confirmatory subslab/crawlspace and/or indoor air sampling is recommended at a percentage of the buildings at each potentially affected site that you have determined to be the most-likely-to-be-impacted... If sampling confirms that any building is impacted on the site, we recommend that the pathway be considered complete. In such case, we recommend that further analysis be conducted to delineate the extent of the impacted building(s) and that mitigation or avoidance measures be considered for the impacted buildings."**

The DOE requests EPA identify methods it recommends for sampling subslab/crawlspace areas. The EPA should also consider providing recommended criteria to determine what percentage of buildings should be sampled. For example, will the required number of buildings be determined, in part, by the type/size of buildings involved or their configuration with respect to pathways for air flow between and around them?

The EPA should be more specific as to what "further analysis be conducted." The DOE requests EPA provide guidance on how to determine the nature and extent of further studies which could be required, based on site-specific conditions.

SPECIFIC COMMENTS – APPENDICES

Appendix A. Data Quality Assurance Considerations

22. **Page A-2, paragraph 1, lines 3-4: "These sampling issues can be addressed, at least in part, by employing software..."**

The EPA states that selection of numbers of samples and sample locations can be addressed by using software designed to optimize sampling design, and describes the use of a Visual Sample Plan (VSP) for this purpose. A VSP is useful for developing sampling designs that can characterize average concentrations within an exposure unit or locate hotspots within soil or groundwater. However, it is anticipated that groundwater or soil gas sampling principally will be used to characterize potential exposure pathways from VOC sources to structures. The sampling locations used to evaluate vapor intrusion more likely will be placed where VOCs are expected to be located, based on the conceptual site model. Accordingly, it may be more helpful to describe such judgmental sampling approaches, rather than referring users to a VSP.

23. **Page A-3, Table A-1: "Example of Steps in the DQO Process using Q5 of guidance."**

DQO steps 6 and 7 default the user to a VSP without providing an indication of how that software would be used (see the previous comment regarding the use of a VSP for vapor intrusion sampling designs). The DOE suggests presenting a hypothetical site problem to illustrate the development of a conceptual site model and DQOs.

24. **Page A-5, Table A-2: "VOC Analytical Methods, their Detection Limits and Estimated Costs."**

The detection limits of NIOSH methods should be presented in units of mg/m^3 or ug/m^3 to be consistent with other air sampling methods in the table.

Appendix D. Development Of Tables 1, 2, and 3

25. **Page D-1, Number 2, "Description of Tables 1, 2, 3," paragraph 2, lines 1-3: "Table 2 provides generic soil gas and groundwater screening concentrations corresponding to risk-based concentrations for indoor air in residential settings..."**

The DOE recommends that exposure factors for nonresidential scenarios be included in this section.

Appendix G. Considerations For The Use Of Johnson and Ettinger Vapor Intrusion Model

26. **Page G-5, Section 3.2, Justification of Default Building –Related Properties, Building Air Exchange Rate (Default Value = 0.25 hr-1), paragraph 1, lines 16-17: "For this draft guidance, a default value of 0.25 for air exchange rate was selected to represent the lower end of these distributions."**

    There is a relationship between building air exchange rate and building depressurization, since depressurization is in part a function of HVAC system operation. Very low building air exchange rates could be associated with low building depressurization. Therefore, selecting conservative upper bound values for both air exchange rate and depressurization could result in the model producing overly conservative and unrealistic indoor air concentrations. The EPA should add a statement acknowledging this uncertainty in the default assumptions, and should encourage users to evaluate the sensitivity of model results to various combinations of air exchange rate and depressurization.

27. **Page G-7, Section 3.2, Justification of Default Building –Related Properties, Qsoil (Default =5 L/min), paragraph 4, lines 6-8: "For these reasons, a soil gas flow rate of 5 L/min (midpoint between 1 and 10L/min was chosen as the input value."**

    With this approach, it appears that EPA will no longer recommend a default pressure difference between soil gas and indoors, but will recommend a soil gas advection rate (which would be calculated from the pressure difference). As discussed in the comment regarding building air exchange rate on page G-5, the default soil gas advection rate may correspond to a degree of depressurization that is not consistent with the building air exchange rate. As with the building air exchange rate parameter, EPA should add a statement acknowledging this uncertainty in the default assumptions, and should encourage users to evaluate the sensitivity of model results to various combinations of air exchange rate and soil gas advection rate.

28. **Page G-8, Number 4, Guidance for Application of JEM as a Site-Specific Tool, paragraph 2, lines 1-2: "In order to ensure the model can reproduce observed field observations, we recommend the model output be compared with measured concentrations..."**

    The indoor concentrations produced by the JEM are not time-weighted averages, which may present difficulties when attempting meaningful comparisons with air monitoring data. Because air samples, even 24-hour time-weighted average samples, represent point estimates of concentration in time, air sampling data may not be representative of modeled concentrations, unless substantial numbers of statistically representative air samples are collected. Therefore, DOE suggests it is not reasonable to use air sampling in this manner (i.e., as a tool for model calibration).

Modeling and air monitoring should represent two lines of evidence regarding the presence/absence and significance of a potential vapor intrusion pathway. Monitoring provides a real, measured estimate of VOC concentrations in indoor air during the monitoring period. Modeling provides an indication of longer-term VOC concentrations in indoor air and is useful for relating specific site conditions to potential VOC concentrations in air. Modeling and monitoring should be viewed in a complementary fashion, as both techniques have relative strengths and weaknesses.

The EPA should replace the current discussion regarding model calibration with a discussion of how modeling and monitoring could complement each other in pathway assessment. The EPA's guidelines for exposure assessment contain a good discussion of the uses for modeling and monitoring in evaluating potential exposures, which should be used as a point of departure for revising this section.

Appendix I. Consideration of Background Indoor Air VOC Levels In Evaluating The Subsurface Vapor Intrusion Pathway

29. **Page I-2, Number 2, CERCLA Guidance on the Role of Background, paragraph 1, lines 6-8: "This policy recommends that when conducting site risk assessments contaminant concentrations attributable to background sources should not be eliminated from further consideration, since it could result in the loss of important risk information..."**

The DOE is concerned that consideration of the CERCLA "Role of Background in the CERCLA Cleanup Program", OSWER Directive 9265.6-07P, May 1, 2002, may not be consistent with the intent of the vapor intrusion guidance with respect to the identification of potentially "complete" exposure pathways. As stated previously in the EI guidance, it is not intended for use in CERCLA risk assessments, or for CERCLA remedy selection. It should be made clear in the guidance that background VOCs in indoor air would not result in a facility failing to achieve a "pathway under control" EI determination.